

THE CRACKER USER'S MANUAL

PROGRAM & DOCUMENTATION

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SOFTWARE TECHNOLOGY LIMITED

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INTRODUCTION

WHAT IS THE CRACKER?

THE CRACKER is at heart a spreadsheet program. A spreadsheet is the general name given to those utilities that lay out data, primarily numeric, in rows of lines and columns, similar to a balance sheet or calculation sheet written out on paper.

In the same way that a word processor program offers considerable advantages in terms of power and flexibility over a typewriter, so a spreadsheet can provide you with all sorts of useful and time saving features not available on a balance sheet. A spreadsheet will also allow you to work on a matrix far larger than could be managed on a simple paper display.

THE CRACKER and the computer that runs it are just tools designed to make life easier for you, and to make the tasks you find difficult or repetitive more enjoyable. Although it may at first seem that there is a lot to learn, you will find that THE CRACKER is just as happy multiplying 2*2 as it is solving complex engineering calculations. You should not be daunted by the size of the manual - THE CRACKER contains some very sophisticated features that allow extremely complex tasks to be tackled with ease. The information has been laid out so that you can quickly and easily find just those features that you require to use and ignore the rest. However, we recommend that you familiarize yourself with all the options available to discover the many inbuilt shortcuts designed to make life easier.

As well as providing all of the traditional features that you would expect from a spreadsheet program, THE CRACKER has been extended in many ways to give you completely flexible control over your everyday data handling and calculation problems. You will find that THE CRACKER can often be used instead of having to buy additional dedicated programs.

No programming language will have to be learnt in order to use THE CRACKER, although for greater flexibility it incorporates some looping features found in high level languages. It will allow you to do most day to day calculations, book keeping and accounts right up to complex scientific equations. The graphics features allow you to produce many different options of graph and chart display which can be sent to a printer or graphics screen (if supported). Simple database-like functions are provided for sorting and searching the data; Input/output functions can control peripherals or external equipment; date and time functions can be built into the sheets and incorporated into the decision making and machinery control.

You will also find that THE CRACKER is one of the most 'intelligent' programs available. Most computer utilities waste an enormous amount of their potential working time just sitting around waiting for the user to decide what has to be done next. You will find that THE

THE CRACKER Introduction
What is THE CRACKER?

CRACKER works much harder than that. For example, any commands or data that you enter are checked for mistakes as you type rather than at the end of a line, or even worse when the program attempts to do a calculation based on the entry. The result is that there is absolutely no ambiguity about where the error lies.

This error handling extends far beyond a simple check of whether the entry is valid in terms of what commands and entries the program will understand. THE CRACKER will also attempt to see whether the entry makes sense in terms of the whole sheet as it is currently set up. For example in most spreadsheets it is important to avoid a forward reference when entering data in a formula e.g. it is usually impossible to enter a calculation in row A, line 1 that reads 2*B2. You will understand that you want the value in B2 to be worked out BEFORE that in A1 or it doesn't make sense, but most programs will attempt to do it the other way around. THE CRACKER works out an 'Order of Recalculation' number for each item as it is entered which ensures that the logical results that you intended are preserved without any need to re-organise the arrangement of the rows and columns in the sheet.

These features often mean that people familiar with other spreadsheet programs find that many of the restrictions they have been accustomed to, simply do not exist.

This manual has been divided into logical sections designed to make it as useful as possible for both novices and more experienced users alike.

Section One is a Getting Started guide giving information on the way THE CRACKER should be configured on your machine together with details of various fundamental aspects of the program such as which keys can be used. It should be read by every new user of THE CRACKER.

Section Two is a comprehensive tutorial guide aimed at new users of the program, consequently not all aspects of the program are detailed. You are taken step by step through the various procedures involved in creating a new spreadsheet and entering and manipulating data, with examples of use given. The early chapters in this section are important as they familiarise you with the way that the program operates and handles data, but certain of the later chapters can be omitted if the lessons within are not of interest.

Section Three gives a quick overview of the various features provided by THE CRACKER and the ways in which they relate to each other. It is, in essence, a summary of the tutorial section and should be read either as a recap of the tutorial or by people who have not used this particular program before but have had previous experience of computing and spreadsheets. If you find some of the subjects hard to follow you should refer back to the tutorial section.

Section Four is designed as a Quickstart and reference guide for those who have had some experience in the use of THE CRACKER, or similar products, and who wish to find details of some commonly used options in a hurry. Page references are given, showing where more information on each section can be found. It is recommended that beginners use this only as a reference guide and supplement to the main index.

Section Five is THE CRACKER Complete Command Reference where full details of every command and feature are laid out in alphabetical order. This will probably be the most frequently consulted area of the book for those more experienced users who are aware of the program's capabilities and who wish to exploit more sophisticated routines.

A full alphabetical index is available at the end of the manual, together with appendices detailing the error messages and the use of THE CRACKER on certain specific systems. Consult the TYPE.ME file, if present on the disk, for the latest details on use of THE CRACKER. Use the DOS system command TYPE to inspect this file i.e.

A>TYPE TYPE.ME

Whilst we can teach you the various features of THE CRACKER it is not possible to give advice on all the many possible uses to which it can be put.

GETTING STARTED

SETTING THE CRACKER UP ON YOUR COMPUTER SYSTEM

THE CRACKER is available for a range of different microcomputers with different Disc Operating Systems (DOS). The DOS is a sort of master program that has overall control of the computer and which organizes the running of applications such as THE CRACKER. Your program may be running on PCDOS, MSDOS, CP/M, MP/M or even Concurrent CP/M. In almost every respect Cracker will behave exactly the same no matter which DOS you use.

You need have no understanding of the workings of the DOS to use Cracker once it is up and running. However, on some machines you will have to be able to understand how to BOOT the DOS in from disk (start it running), and it is probable that you will also need to know how to use the DOS to handle the copying and renaming of data files.

You are strongly advised to prepare a backup version of your Cracker program disk and to keep the original in a safe place in case of accidents.

If you are in doubt about such operations then you should consult either your particular machine's manual or the dealer who sold you your computer. Genuine problems that arise during the use of THE CRACKER and which cannot be solved by reading this manual should be referred to your supplier or the author. We cannot, however, undertake to offer solutions to problems regarding the use of your computer system.

Details and advice on using THE CRACKER with some specific computer systems are given in the appendix.

Installation of THE CRACKER

In many cases you should find that THE CRACKER can be bought in a form that is already installed to work on your computer system. If not, you should find that there is a program called INSTALL supplied on the disk. By running this (simply type INSTALL at the DOS prompt with THE CRACKER disk in drive A) eg:

A>INSTALL

you will then be asked a series of questions about your computer which will tell THE CRACKER which machine it is working on and which internal adaptations to make.

Creating a work disk.

In order to function properly the program will need access to these files on the work disk:

- 8 bit computers CRACKER.COM
 CRACKER.OVR
- 16 bit computers CRACKER.COM (or CRACKER.OMD or CRACKER.EXE)

(8 and 16 bit are computer jargon terms that refer to the power of the internal microprocessor chip. If in doubt just look to see what files are present on your program disk.)

You will find that a file called CRACKER.HELP is also supplied. This file is not necessary to the running of THE CRACKER but you will need to have it on your program disk if you require help messages whilst you are using the program.

On 8 bit systems you will not need to have access to the file CRACKER.COM once the program has loaded UNLESS you are going to use the graphics facilities.

It is difficult to give definite advice on the best arrangement of program and data files for all systems, as this depends on the number of disc drives, the disc capacity, the computer's free memory, your intended use of the program etc. In general, however, on computers with two or more disc drives it is sensible to use THE CRACKER work disk in drive A and a data-only disk in drive B.

On 8-bit computers with one disc drive you will need to have at least CRACKER.OVR present on each disk that you use.

On computers that have a RAM disk you can transfer at least the CRACKER.OVR file into memory so that it can be accessed much more quickly and the program runs without interruption. You can then use the disc drive(s) for data discs. A specific example for Amstrad PCW computers will be found in the appendix.

Cracker data files

To help with the preparation and safeguard of working disks here is a brief summary of the way in which THE CRACKER handles data files. The information presented here will be covered in more detail in later sections of the manual and is not intended as a substitute for reading those. See also the Copy Command in the Complete Command Reference.

THE CRACKER can only read or write files with the following filetype extensions:

- .MEM
- .DAT
- .DIF
- .TXT

As you will see later, THE CRACKER treats each of these files in slightly different ways and sometimes expects the information in them to conform to certain types.

Any file that is saved with the same name as an existing file on the disk will cause the original to be renamed with the extension .BAC. If you then decide you want to re-access the data held within this backup, you will have to rename the file in such a way that it has the appropriate Cracker filename extension. If a third file is re-saved with the same name the second becomes the BACKUP file and the original is erased completely.

There are two ways of quitting THE CRACKER (other than resetting the computer). You can use the inbuilt Q for quit option which will automatically save your data in an emergency file called SECURITY.MEM. To guarantee the safety of your data whenever you have taken this option, you must remember to rename this file before you create another SECURITY.MEM on the same disk. This can be done either directly or by re-loading it into THE CRACKER and then re-saving it using a different name.

There is also an option to exit from Cracker and make an immediate return to the control of the DOS by pressing CTRL-C. Use this option with care as no security back up of your data will be made.

If a request is made to see the disk directory whilst THE CRACKER is running, only those files with recognized filename extensions or .BAC files are displayed. Files can be renamed directly from within THE CRACKER; Different User Number directories or sub directories can be accessed as well, depending on which DOS you are using.

If you are using Cracker to handle important data you MUST learn to be sensible with the discs that you use. To safeguard against the accidental loss of your work you should always save the data at frequent intervals, if necessary using a temporary filename. To do so use the Copy All to File command.

At the end of each work session it is advisable to make copies of your current data files on two separate discs, in case one becomes lost or damaged. Strong magnetic fields, power surges, coffee cups and fingerprints are all sufficient to corrupt a disc.

On those DOS systems that support Passwords you can add these from within Cracker by saving the data with a further eight letters preceded by the ':' symbol.

For example one such filename may be saved and loaded as

MYDATA.MEM;SECRET

The password extension will not be displayed in the disk directory but you must provide it in the format above before you can read, erase or rename any of the files. It is important to remember or make a note of any such password.

SOME POINTS ON USING THE CRACKER

Arrange THE CRACKER program and data discs in the way that suits your system best. Put the disc with CRACKER.COM in the current drive and type CRACKER<return>.

After a moment or two you should see a screen like this.

```
Next: Copy, Insert, Which files, Auto., Quit          65519
                                                Auto.

Press ? for HELP anytime

THE CRACKER
Copyright 1984-1986
I.W. Searle
All Rights Reserved
MSDOS
86-100000 V2.33
```

Don't do anything yet, but note that the only logical options open to you at this stage would be to load in an existing worksheet or to start a new one from scratch.

Towards the top of the screen you will see some words beginning 'Copy...'. These are a list of all the available commands at this stage.

The command you want if you are starting a new file is I for 'Insert'.

To load in an existing file type CF for 'Copy a File'.

To get a disc directory type W for 'Which files'.

If you type ? you will be provided with some extra help.

```

E23
54893
Auto.

(1)
Gen ABCDFGJLHMOPRSTUVWXZ!-~/>./(* arrows
Next:

PRIMARY COMMANDS

A Automatic calculation on/off
B Blank an area of worksheet
C Copy command (to Load & Save)
D Down cursor movement
E Edit the current cell
F Format set and make an entry
G Get or search for a string
H Insert lines or columns
I Jump to cell or across sheet
J Left cursor movement
K Move an area of worksheet
L Move, change formats or width
M Out, set up the printer
N Partition screen into windows
O Quit the program
P Right cursor movement
Q Sort the lines

T Trace graph to screen or printer
U Up cursor movement
V Verify sheet or recalculate
W Which files, directory, utilities
X exchange rules(formulae)/results
Z Zap (delete) an area of worksheet
! Force a recalculation
+ Move screen down a page
- Move screen up a page
) or ; Move up or down a window
/ Move left or right a window
> Make entry with column format
> As above
( Expression entry, global format
) or * Text entry, global format
* Macro command
arrows Cell cursor movement
    
```

Type w now to get a list of all the demo files that are supplied on your program disk.

```

65519
Auto.

Next: UTILITIES
> .
> .
C: CRACKER SAMPLE1 BAC
> .
> .
IRR MEM MEM
TAX MEM MEM
SALES MEM MEM
ADLIST MEM MEM
TBEM MEM MEM
PLOT2 MEM MEM
PLOT1 MEM MEM
SECURITYMEM
SAMPLE1 MEM
BUMMER MEM MEM
SAVE1 MEM MEM
SALES TXI TXI
TABLE2 TXI TXI
TAX TXI TXI
EXAMPLE LAI
SECURITYBAC
PLOT BAC
    
```

RUNNING THE DEMONSTRATION WORKSHEETS PROVIDED

On the distribution disc you get THE CRACKER together with five example worksheets. These are the files with the extension .MEM.

You can select the file you wish to run by specifying the name when you first load THE CRACKER. Look at SALES.MEM, for example, by just typing:

A>CRACKER SALES

SALES.MEM is a sample commission calculation showing results based on a stepping scale and a sliding scale.

TAX.MEM is an example tax calculation for the self employed. This uses the function POS specially created for tax calculations, which has no effect if the argument is positive but gives a value of zero if the argument is negative.

TBEM.MEM shows how an engineer might work out the properties of a T-beam. With routines like this whole books of formulae and tabulated results can be dispensed with.

IRR.MEM shows how to work out the internal rate of return. The program in this case actively searches for an answer as this is the only way this problem can be solved. This worksheet uses DO and WHILE and several other useful functions. You won't be able to prepare this type of worksheet until you are quite experienced but it does show the level of sophistication to which you can go.

PLOT1.MEM and PLOT2.MEM are worksheets set up for graphics. See the TRACE command notes for details of how to use the graphics.

Also included are the two programs needed to convert files to and from the popular business database program DBASEII, these are MEMDBF.COM and DBFMEM.COM. DBF.DOC tells you how to use these programs.

WORDS

Before we can go on to discuss the finer features of THE CRACKER we must first deal with some matters of terminology. The spreadsheet is like an enormous piece of paper divided into a grid by vertical COLUMNS and horizontal rows or LINES. By convention the lines are numbered down the page from 1 and the columns are labelled alphabetically from left to right starting with A to Z, followed by a, b, etc.. (Remember that when referring to a column within the range A-Z you must use the SHIFT key to get a capital letter for specifying the coordinates. If you forget to do this you will get unexpected results or an 'Out of Range' error message.)

The smallest unit of the worksheet is a CELL, produced at the crossing point of one line and one column. Each cell is referred to by its column and line coordinates. e.g. A1, B12 etc. The cell is where you enter each individual unit of your data, and each piece of data is known as an ENTRY. The entry can be of three types, text, numbers or a mathematical formula known as an EXPRESSION that resolves to a numerical value.

Since you are concerned with entering information into one cell at a time, the currently active position is shown on screen by a 'cell cursor' denoted by an angled bracket on either side of the cell (i.e. < >) or possibly by a different screen colour. Information about the current cell is displayed on top of the screen, as we shall see later.

The lines of the sheet are, again by convention, only one character deep. The columns can be DISPLAYED as any size up to a maximum of 24 characters with the boundaries displayed by upright bar characters '|'. In fact, the size of each cell is not limited by the size of the display, but can hold any length of data you wish to enter up to a maximum determined by the width of the entry line on the screen (even this restraint can be overcome by the use of the '|' key as we shall see later). If the display size is smaller than the length of the data then THE CRACKER displays as much of it as it can if it is text, or some warning characters if it is numeric, so that you are not misled by truncated figures - in either case no information is lost.

Any data, text or numeric, that will be used by the program in its calculations or other manipulations must by necessity be restricted by the maximum size of the entry. It is important to understand, however, that it is not restricted by the apparent size of the cell on the screen, which can be shortened down to only one character wide. THE CRACKER will display as much of the information held in that cell as is possible given the limitation of the display and of the display FORMAT (don't worry about what a Format is just now, it will be dealt with in more detail later). The true value of the data is used in all calculations regardless of the way it looks in the display.

As an exception to the above rule it is possible to specify that Text data should be spread over several cells to act as permanently visible comments on the data that is being displayed.

The worksheet itself can be many times larger than can fit on screen at any one time - in fact, up to a maximum of 52 columns by 255 lines. You will find that as you move the current cell cursor position your view of the sheet will move with it, changing the cells that are displayed. In computer terms, you have a 'scrolling window' onto the sheet.

As well as entries, columns and lines THE CRACKER is also able to manipulate specified BLOCKS of the worksheet. Consider a block as a rectangular area of the sheet which you define by giving the coordinate of the top left and then the bottom right corners. You will find this feature very useful to collect your information together and then rearrange it in any way you like. A defined block can even be as big as the whole sheet if you wish to duplicate all of your work to date.

The full list of the parts of the worksheet is:

- Entry a single cell containing data.
- Column a vertical band.
- Line a horizontal row.
- Block a rectangle from within the sheet.
- All the whole of the sheet.

You will see later that only a couple of THE CRACKER's commands, Blank and Copy, can work on all five options. You will always be reminded which options are available via prompts displayed on the screen.

SINGLE KEY COMMAND ENTRY

All commands that are available with THE CRACKER work on a system whereby you are provided with prompts to remind you of what is available, you then select the desired command by a one letter keypress based on a mnemonic of the full command name. You will find this a very convenient and easy method to use, but beware typing the command name in full or you may end up in some unexpected places. Don't worry if this happens - just press [ESC]ape and you will be back to something you recognize with no harm done.

Watch the prompt line while you are finding your feet to keep track of all the available choices, and use the help option for more detailed information.

DETAILS OF THE SCREEN.

To introduce you to the display here is a quick rundown of what the various pieces of information on the screen stand for. If you have not used a spreadsheet program before don't worry if you can't take it all in at once, just use this section for reference as you progress through the tutorial course.

SECTION PROPERTIES OF T BEAM		D17 64911 Auto.	
AXL	ABCEFGIJKLMNOPQRSTUVWXYZ+-\>/'* arrows		
Next:			
1	<SECTION PROPERTIES OF T BEAM >		
2	3 DATA INPUT SECTION		
4	Width of top	150	
5	Depth of top	15	
6	Overall depth	160	
7	Flange thickness	15	
8	WORK AREA		
9	Depth below table	85	
10	Area of table	2250	
11	Area below table	1275	
12	RESULTS		
13	Area of section	3525	
14	Depth of neutral axis	25.59	
15	'I'		'R'
16	xx direction	0.2844E+07	28.41
17	yy direction	0.4243E+07	34.63
			3822.81
			56369

The screen is divided into two main areas, the worksheet itself which takes up the majority of the bottom of the display, surmounted by a three line status area giving information on the state of the sheet. Note that the actual worksheet display is determined by the chosen column widths, the selected format and the result of calculations performed on any formulae that are entered into the cells.

Starting with the top line of the status area, on the leftmost side is a figure showing the coordinates of the currently active cell. This is followed by the contents line which displays what information was actually entered in the current cell, as opposed to the information that has been calculated and displayed in the worksheet area. On the right side of this line is the coordinate of the bottom right cell in the currently defined sheet - this gives you an indication of the size of the work area.

The second line begins with a one or two letter indication of the display format that is in operation on the current cell, next to this is the prompt line on which you are presented with a summary of all the keypress options available to you at that time. The prompt line that you will see on first loading THE CRACKER presents you with the options:

Copy, Insert, Which files, Auto., Quit

However, when you have made certain choices, such as creating a new sheet you will be presented with this line

ABCDEFGHIJLWNPQRSTUWXYZ!+->.<('* arrows

This line can be regarded as the central command panel for THE CRACKER. At this point there is almost every available option open to you, in fact there are so many that it is impossible for the prompt line to give any more help than to provide you with the single key mnemonics. If at any time you cannot remember what any letter or symbol stands for, then press the '?' key and THE CRACKER will provide you with a more detailed explanation of the available options, as long as the file Cracker.hlp is on the current program disk.

```

A1      Gen  ABCDEFGHJLWNPQRSTUWXYZ!+->.<('* arrows
Next:
PRIMARY COMMANDS
A Automatic calculation on/off
B Blank an area of worksheet
C Copy command (to Load & Save)
D Down cursor movement
E Edit the current cell
F Format set and make an entry
G Get or search for a string
H Insert lines or columns
I Jump to cell or across sheet
J Left cursor movement
K Move an area of worksheet
L Move, change formats or width
M Out, set up the printer
N Partition screen into windows
O Quit the program
P Right cursor movement
S Sort the lines

I Trace graph to screen or printer
U Up cursor movement
V Verify sheet or recalculate
W Which files, directory, utilities
X exchange rules(formulae)/results
Z Zap (delete) an area of worksheet
! Force a recalculation
+ Move screen down a page
- Move screen up a page
/ or ; Move up or down a window
> Move left or right a window
< Make entry with column format
( As above
) Expression entry, global format
* Text entry, global format
. Macro command
arrows Cell cursor movement

```

A1
65519
Auto.

On the right of the line is a figure representing the number of bytes of available memory left in your current sheet. THE CRACKER will keep track of this and will not let you lose your work if all the memory is used up.

The last line of the status area begins with the prompt 'Next:' followed by the entry line. The entry line displays the commands or data that you are currently typing into the sheet. In the case of the commands each single keypress is expanded into the full command word, or words, that it represents.

If the message AUTO appears at the end of the line then Automatic calculation is selected. This facility is detailed later.

A flashing character cursor (the cue) shows your current position on the entry line.

There is a second type of worksheet display that you can toggle on or off with the command X for exchange. In this case each cell shows the information that was entered directly into it irrespective of the result of any calculations or of the selected display formats. This is particularly useful for viewing formulae that have been entered as opposed to their results. It may be necessary to make adjustments to the column widths to be able to view all of the data or formulae that has been entered.

THE CRACKER Getting Started Alternative keys

ALTERNATIVE KEYS

It is unfortunately common for different computer manufacturers to give their machines different key arrangements. Usually we can rely on certain keys that are almost always provided and the bulk of this manual will be written as if these keys are present on every machine. Possible exceptions to the normal key arrangement are detailed here.

On some machines you may be able to use a backspace key to duplicate, or substitute for, the [DEL] key. On some machines the [DEL] key or keys can be made to work in two directions on screen, from right to left or from left to right. Wherever [DEL] is mentioned in this manual it should be taken to represent 'Delete from right to left'.

Some machines do not provide a cursor key cluster and it is common for programs to allow an alternative diamond shaped cluster of alphanumeric keys to be used in their place. This is the case with THE CRACKER which uses a combination of the Control and WADX keys to move the current cursor location.

The keys L,R,U,D can also be used to move around the sheet acting as mnemonics for the commands Left, Right, Up and Down. These have the additional advantage that they can easily be incorporated into a command Macro. As will be seen later these keys occasionally have a slightly different effect compared to the diamond cursor movement cluster or arrow keys in order to avoid ambiguity between the backspace key (see above) and the left arrow key.

THE CURSOR

U, up arrow,	CTRL-W	cursor up
D, down arrow,	CTRL-Z	cursor down
L, left arrow,	CTRL-A	cursor left
R, right arrow,	CTRL-D	cursor right
+		down one page.
-		cursor up one page.
J (cell coordinate)		cursor to specified cell

Other variations worthy of note are the use of an [ALT] key to substitute for the Control key and the use of [EXIT] to represent [ESC]. Both of these alternative key legends are found on the Amstrad PCW series.

If the single quote ' key is not directly available to you on your keyboard you can use the double quote " as an alternative. Similarly you can use a ';' semicolon instead of a '\' backslash.

THE CRACKER Getting Started The Keyboard

THE KEYBOARD

Again for reference purposes here is a rundown of some of the keys you will be using most often. Don't worry about trying to remember it all first time, practice will make them familiar.

You probably know about upper and lower case characters - you hold down a shift key while typing a letter to get the upper case capital form. You may not know that there is a second form of shift key which is marked CTRL for control. This is held down in the same way as the shift while a letter is typed. CTRL-H means hold down the CTRL and type the letter following the dash (in this case 'H').

The [ESC] or escape key is well named and very important. It is used to let you exit without harm from any commands that you may have set into motion and then regretted. You are returned back to the main primary command prompts ABC etc..

Most of the alphanumeric keys will be used at one time or another to represent various choices for the single-key-entry commands.

It is possible to enter commands faster than THE CRACKER can process them, but THE CRACKER has a built in type ahead facility which stores these commands until they can be processed. If the type ahead buffer becomes full, then you will hear a beep and the character you typed will be ignored.

HOW TO GET HELP

If at any time you find that you do not recognize or cannot remember the prompts that are displayed on the screen, entering the '?' character will call up explanatory text, provided that the CRACKER.HELP file is present on your program disc. Exceptions are when entering text or while actually editing a cell.

Press any key other than [ESC]ape to return to the situation before calling the help screen. Pressing [ESC]ape will return you to the primary command options.

WHAT TO DO WHEN YOU MAKE A MISTAKE

You will always know when you have made a mistake because THE CRACKER will give you a beep and an explanation of your error. THE CRACKER will make sure that whatever mistake you make it will do no harm to your work. Just press the [DEL] key to back up the cue to the place before your mistake. If your normal backspace key works then use it wherever the [DEL] key is mentioned. THE CRACKER usually checks for a mistake as each key is pressed and so you will rarely have to make long corrections. If you change your mind about an entry and want to abandon what you are doing just press the [ESC] key. This will stop the current entry and return the worksheet to the exact state before you started the entry.

Unfortunately, THE CRACKER cannot catch mistakes in your logic that are still legal commands.

LEAVING THE CRACKER

If at any time you want to leave the worksheet you can use the QUIT COMMAND. Type <Q> and your work will automatically be saved up to this point in a file called SECURITY.MEM. This file is automatically updated and overwritten every time you use the QUIT COMMAND. This is an EMERGENCY ONLY save of your work and normally you should copy all your work to file with your own choice of name.

SAVING YOUR WORKSHEETS

IT IS ESSENTIAL that you make very regular back ups of your work. Every half hour would be a good idea and so if the worst happens it will only take you half an hour to recover the situation. Keep asking yourself how you would feel if there was a sudden power failure, your equipment failed, or (heaven forbid) there was a bug in THE CRACKER that you happened to stumble across.

All you need to do is type CAPname<R> which means Copy All to filename "name" - the <R> means the Return key. You should choose your own filename which can be a single letter.

If you receive the message 'Disc full' don't panic - you have two possible options. First of all, you can use the Which Files option to erase some unwanted files from the disc. Alternatively, if there are no files that you can afford to lose, you can change the disc in the drive and attempt the save again.

THE CRACKER TUTORIAL

I. BASIC TECHNIQUES

CREATING A WORKSHEET

This is the picture you will have on your screen after first loading THE CRACKER.

```

Next: Copy, Insert, Which files, Auto., Quit
      Press ? for HELP anytime

      65519
      Auto.

      THE CRACKER
      Copyright 1984-1986
      I. W. Searle
      All Rights Reserved
      MSDOS
      86-100000 V2.33
  
```

Initially no sheet exists, so you will have to build one up as required. A full explanation of the following steps will be given later but for now just follow the directions.

The first command you will be using is I for Insert. Type the following sequence I<20><R><R> and as you type note that each letter is shorthand for a full word and that the program prompts you with all the available choices at every stage. Wherever possible, the commands will be given their full names on the prompt line but when there are too many options available then abbreviations will have to be used.

```

Next: Insert column, width 20
      Press ? for HELP anytime

      65519
      Auto.
  
```

THE CRACKER TUTORIAL I Creating a Worksheet

The <R> is only one keystroke and is shorthand for the RETURN or ENTER key.

The C in the above sequence stands for Column and the 20 tells THE CRACKER the width that you want this column to be. The 0-9 on the prompt line at this stage means that a numeral may be entered. Note that however big the number you want to enter the prompt remains at 0-9 because it only refers to the next character you are going to enter.

You will see from the prompt line that the G stands for General Format but don't worry too much about what that means just now. (The format is simply the system by which THE CRACKER decides how it is going to display the data, and the General format is a simple all-purpose display type similar to that which you would see on a calculator.)

```

Next: Default Format to be General
      Press ? for HELP anytime

      65519
      Auto.
  
```

The single key-stroke sequence used by THE CRACKER to symbolize each of the available commands should be extremely convenient to use, but you must remember not to try to type the commands in full or some unexpected effects or error messages may appear. A similar form of prompting is used in a lot of computer programs, and is normally referred to as a menu (i.e. a list from which you make your selection).

Now type I10I<R><R>. This stands for Insert 10 Lines (i.e. make the worksheet ten lines deep). The screens you will see are:

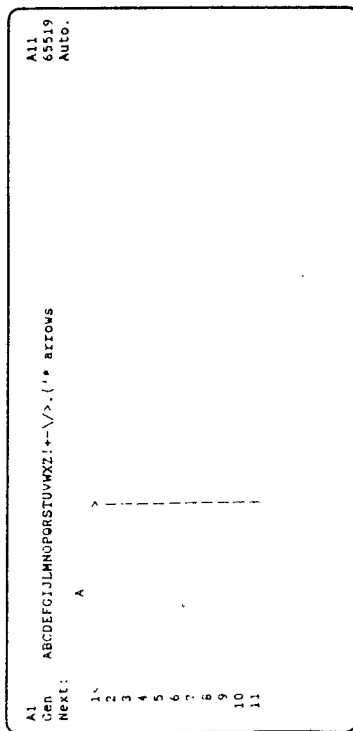
```

A1
Gen
Next: Insert 10 lines
      I<
      A
      <R>
  
```

```

A1
Gen
Next: Destination
      I<
      A
      End, Up, Down, Left, Right, arrows, Jump, <R>
  
```

After pressing <R> when prompted for the Destination you will see this.



The active cell is the cell that is ready for you to enter data into it. Try this now quickly by pressing the '.' key which signals to THE CRACKER that you want to type in some information. Type a few figures followed by <R> and you will see your data appear in the active cell.

Practice with the commands you have learnt so far - you can't do any harm to the program by experimenting.

If you have had enough for one session use the CTRL-C or QUIT options to leave the sheet.

Unless you particularly want a copy of the work you have done so far, there is no advantage in using QUIT, but it is probably a sensible habit to get into.

These commands have been used to define the width and depth of the worksheet, in this case one column of 20 characters and ten lines deep, and you now have created enough room to begin experimenting. Incidentally, you are always free to extend the worksheet any time that you wish.

If you make a mistake, just press the [DEL] key and you will go back to the stage before your error. If you want to abandon the sequence entirely press the [ESC] key and you will be returned to the opening menus. No harm will be done.

The numbers that you now see running down the screen are the worksheet line numbers and the A above them is the worksheet column letter. By defining the number of columns across and the number of rows down we have divided the sheet into a grid. Each individual unit of this grid is called a Cell.

The cell cursor is usually shown as a pair of angled brackets < > but on your screen it may be different. This cell cursor marks the current active cell which is where many of the commands you type in will take effect.

Each cell has a name, or coordinate reference, which you get by combining the column letter and the line number. At the moment, the cursor is in column A and line 1 so the coordinate reference is A1; as this is the active cell, you will see this coordinate displayed at the top left of the screen.

Type <R> for destination

```

A1      All
Gen     65519
Next:  Destination      End, Up, Down, Left, Right, arrows, Jump, <R>
      A
1<
2
3
4
5
6
7
8
9
10
11

```

Each new column you create will have its own default format, i.e. every single cell in the column is regarded as holding the same type of data (numbers or text), that is to be displayed in the same way, unless you specify otherwise. You will learn about formats later, for now in response to the 'Format?' prompt type G<R> for General:

```

A1      All
Gen     65519
Next:  Default Format to be General      <R>
      A
1<
2
3
4
5
6
7
8
9
10
11

```

Next try entering some extra lines with ISL<R><R> for Insert 5 Lines, destination above the cursor. You will see:

```

B1      B11
Gen     65519
Next:  Insert 5 lines      <R>
      A
1
2
3
4
5
6
7
8
9
10
11

```

INSERTING AND DELETING ROWS AND COLUMNS.

Now that you have had your first experience at using the sheet, it is time to look more closely at the commands used for creating and deleting parts of a spreadsheet.

As you have seen, we cannot enter data into a sheet until we have first told THE CRACKER to create one. Each sheet is built up by inserting a number of rows and columns to define the desired grid size, it follows from this that every sheet we create will be rectangular in shape.

Having defined a sheet of a certain size it is also important to be able to remove unwanted parts of the grid. For this we use the Zap command.

The Insert and delete (Zap) commands act on rows or columns, either one at a time or in groups. You can also clear anything you have done so far with ZA<R>Y<R> i.e. 'Zap All'. Note that THE CRACKER asks for confirmation before proceeding with this possibly disastrous command. For now just answer 'N' for No.

```

A1      All
Gen     65519
Next:  Zap (delete) all - Confirm N      <R>
      A
1<
2
3
4
5
6
7
8
9
10
11

```

Now type IC10<R> for 'Insert Column of width 10':

```

A1      All
Gen     65519
Next:  Insert column , width 10      0-9, <R>
      A
1<
2
3
4
5
6
7
8
9
10
11

```


THE CRACKER TUTORIAL. 1
Destinations

A NOTE ON DESTINATIONS

When you are inserting any lines or columns you will be prompted with this range of options for the Destination:

End, Up, Down, Left, Right, arrows, Jump, <R>

Of these options UDLR, arrows and J all serve to move the current cursor position. When you have the cursor positioned where you want it in the sheet use the <R> key to make the insertion.

A new column will be inserted to the left of the column containing the cursor when <R> is pressed. A new line will be inserted above the line containing the cursor when <R> is pressed.

'E'nd is a special command that simply tells THE CRACKER to add a new line or column at the end borders of the current sheet i.e. columns are added to the right of the sheet, lines are added to the bottom.

When using the End option the cursor is positioned in the new line or column ready for the insertion of data.

MOVING AROUND THE SHEET

Try moving the cell cursor around the sheet you have created by typing D for Down. Note that active cell coordinate at the top changes as the cursor moves down. Move the cursor back up again with U for Up.

If you have more than one column inserted you can use the L and R keys to move the cursor Left and Right. Make your sheet larger now by typing I5C10<R>G<R><R> and practice using all of the possible movement keys summarized below.

- U, up arrow, CTRL-W Any of these move the cell cursor up one cell.
- D, down arrow, CTRL-Z These move the cell cursor down.
- L, left arrow, CTRL-A These move the cell cursor left.
- R, right arrow, CTRL-D Right movement of the cell cursor.
- + Moves the cell cursor down one page.
- Moves the cell cursor up one page.

If you have to move the cursor some distance you will find it easier to use the Jump command. This command goes directly to the coordinate that you specify. Type JBz<R> and you will see:

THE CRACKER TUTORIAL. 1
Inserting and Deleting Rows and Columns

As well as asking WHAT you want to add to the grid THE CRACKER also needs to know WHERE you want to put it so it prompts you for the Destination of the inserted lines.

```

A1      B16
Con     65519
Next:   Auto.

      A      B
1 <----->
2 -----
3 -----
4 -----
5 -----
6 -----
7 -----
8 -----
9 -----
10 -----
11 -----
12 -----
13 -----
14 -----
15 -----
16 -----

```

If you just type <R> when asked for this destination, as we did in the examples they will be put in front of the cursor. Your only alternative at the stage when only one line exists is E<R> for End, in which case it will be put after the cursor. When you have a more complex sheet already defined, there will be more possible options and you can insert new lines into the middle of the ones already defined.

By inserting columns and rows in this way, you can build the worksheet up to a possible maximum of 52 columns and 255 lines. The actual limitation on size will be useable memory available on your computer system. THE CRACKER is designed to use absolutely the minimum memory and so only those cells which are occupied with data use any memory at all. You can, therefore, start with as big a sheet as you like and fill in the detail later.

You can use the Z for Zap command to reduce the sheet by column, by line or as a whole (i.e. a clean start) with the ALL option. You will get more information about these later.

Experiment with inserting some more columns. You will notice that they can be inserted on either side of the current column, using either the left or right arrow keys; other options are at the beginning and end of the sheet.

B16
65519
Auto.

Gen 0-9, <R>
Next: Jump to B2
A

B

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

and the active cell will move accordingly:

B16
65519
Auto.

Gen ABCDEFGHIJKLMNOPQRSTUVWXYZ!+~\>{** arrows
Next:

A B

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

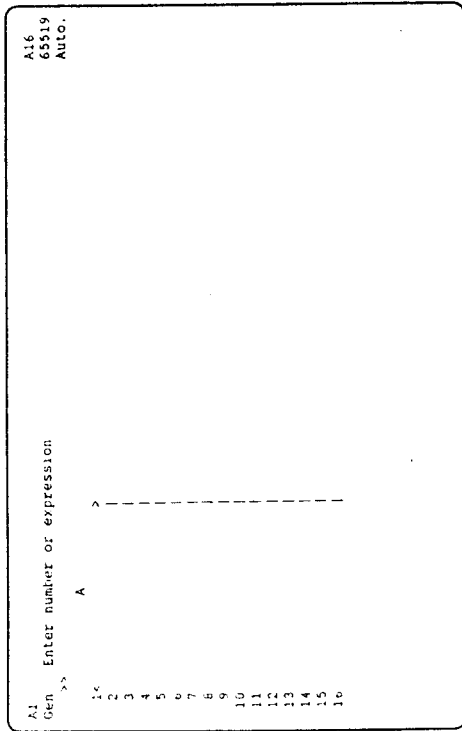
THE CRACKER TUTORIAL I
Moving around

There are two other possible jump destinations - Begin and End, which refer to long jumps to the specified edges of your worksheet.

At different times when working on the sheet you will find that you will need to use different cursor movement keys. For example when entering text data you cannot use the L, R, U, D keys for movement because THE CRACKER will interpret them as part of the text. On the other hand you will learn later that it is possible to define an inbuilt subroutine of commands called a MACRO. When using these you can enter LRUD as parts of the command, but it is impossible to do the same with the arrow keys.

ENTERING SOME SIMPLE DATA

Now that we know how to create a sheet, and how to move around it we can start to fill our grid with data. Start a new sheet by typing ZA<R>Y<R> and then IC20<R>G<R> and I15L<R><R>. Type ',' (the full stop) and the screen will change to show these prompts:

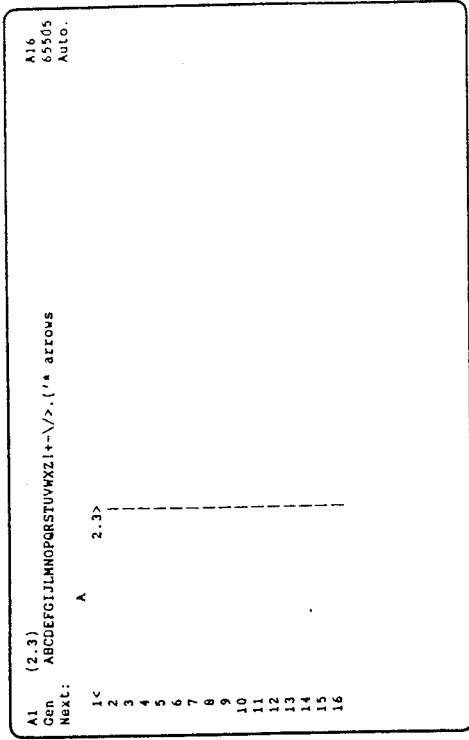


This is called entry mode and as you may have deduced THE CRACKER is now ready to accept some form of data. This can be possibly text, a number or an expression. These are the three types of entry that are possible. The possibilities open to you are determined by the broad choice of format type you have made, i.e. between a format suitable for text or one suitable for numbers.

The amount of data that can be entered into this cell is limited by the width of the Entry line.

The worksheet we have defined so far has used the format type G for General which is a format suitable for numeric data. The prompt you receive will reflect this. Try it now, enter a number 2.3 and press <R> (RETURN or ENTER). If you make a mistake press the [DEL] key and the cue will backspace removing the last character or command. Your data will return to the state it was in before you made the mistake.

Your screen will look like this:



Note that the contents line at the top now has your entry enclosed in (). The brackets are an indication that the entry is a number or expression. You will see later that if it had been an expression the contents line would show exactly what you had typed but the display would only show the calculated result. Note also that the memory has gone down a little.

You are next going to see the power of THE CRACKER. Move the cell cursor down with the D key and press ',' again. This time enter 2+A1<R> which is an expression meaning '2 plus the current value at coordinate A1'. You will now see:

A3	(2+A1)		
Gen	ABCDEFGHIJKLMNQRSTUWXYZ!+*~>.<.* arrows		A16 65490 Auto.
Next:			
1		2.31	
2			
3		4.3>	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

Note that the RESULT has been calculated and shown in the display.

Go back to A1, select entry mode again and enter a new value. You will note that A2 changes at the same time. You have managed to enter an expression that uses a value from another cell and this expression works however you change that cell value. The same principle can be extended to operate over the most complex of worksheets and formulae.

Note that although the sheet display shows the RESULTS of the formula you enter the entry line still shows the expression that you entered in the brackets.

A1	(36.9)		
Gen	ABCDEFGHIJKLMNQRSTUWXYZ!+*~>.<.* arrows		A16 65489 Auto.
Next:			
1		36.9>	
2			
3		38.9	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

Note also how easy it is to alter an existing cell entry by just typing in a new value.

Now look at this list to remind yourself of some of the features you have seen so far.

- I is used to insert columns and lines.
- U moves the cell cursor up.
- D moves the cell cursor down.
- ',' allows you to enter a number or expression.
- <R> stands for the RETURN OR ENTER key.
- [ESC] press this key to abandon the current operation, without harm.
- [DEL] use this key to backspace.

A1, A2 are cell coordinates and may be used if they are numbers in an expression.

It will now be coming apparent that you will be able to build complex expressions, and if you change the data in some cells you will always come out with a valid answer in the others.

THE CRACKER gives you the power to test the effect of different values on an answer and so do 'what if?' assessments of a situation.

ENTERING TEXT

Now you are going to create another column and insert some text instead of a number. Type IC20<R><R>IL<R>. Some of these commands we have met before. The IL command is the default format for the column we have created; I stands for Text which tells THE CRACKER what type of information to expect; L stands for Left justified which just means print the text from the left hand edge of the active cell.

You will see screens like these:

```

A1 (36.9)
Col 0-9, <R>
Next: Insert column, width 20
A 36.9
1< 38.9
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
    
```

```

A1 (36.9)
Col 0-9, <R>
Next: Default Format to be Text left justified <R>
A 36.9
1< 38.9
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
    
```

```

A1 Enter characters
TRIL >>
A >
1< 36.9
2 38.9
3
4
5
6
7
8
9
10
11
12
13
14
15
16
    
```

Column A is now set up for you to put in the text. Note that the original column has been shifted to the right and labelled B. This shows how easy it is to alter the dimensions of your worksheet grid at any time.

Before you go any further, press <R> and then use the R key to move the cursor to location B3 which contains the expression we have already typed in. If you look at the top line of the screen you will see that the A1 which you have typed in has now changed to B1 to keep track of the effect of entering another column. You can rest assured that your expression will still work the way you intended it to.

```
B3 (2*B1) B16 65487 Auto.
Cen ABCDEFGIJKLMNOPQRSTUVWXYZ:~\>.(/* arrows
Next:
1 1 36.9|
2 2 38.9|
3 3
4 4
5 5
6 6
7 7
8 8
9 9
10 10
11 11
12 12
13 13
14 14
15 15
16 16
```

Go back to A1 using the L key for left and the U key for up. Type ' ' and you will see this:

```
A1 B16 65489 Auto.
TxTL Enter characters
>>
1< A > B 36.9|
2 38.9|
3
4
5
6
7
8
9
10
11
12
13
14
15
16
```

The Entry Line will display a marker that reminds you of the current display width but this can be exceeded - the actual amount of data that can be entered is limited by the absolute width of the Entry line.

Now enter some text, type First number<R>. You should see:

```
A1 B16 65476 Auto.
TxTL ABCDEFGIJKLMNOPQRSTUVWXYZ:~\>.(/* arrows
Next:
1<First number A B 36.9|
2 38.9|
3
4
5
6
7
8
9
10
11
12
13
14
15
16
```

You should have seen the entry reflected in the contents line as you have typed it.

RECAP: You have now tried both expression entry and text entry.

- R moves the cell cursor right
- L moves the cell cursor left

The difference between text and number data

THE CRACKER TUTORIAL

II. MORE ADVANCED TECHNIQUES

UNDERSTANDING THE DIFFERENCE BETWEEN TEXT AND NUMBERS

You will have seen already that the data that has been entered can be displayed in a variety of different ways, as defined by the current format. There are about a dozen built in formats that can be used but they divide into two broad types, some relating to text and some relating to numerical data. It is possible to switch formats as long as the cell is empty, or the data within a given cell can conform to the new type. For example, we can switch a number between Integer format, which only displays the whole number part of a value, to a Financial format, which displays data correct to two decimal places. Text cannot be displayed in an Integer format for example and THE CRACKER will catch any attempt to do so during the entry process.

On the other hand, textual data cannot be processed to a numerical value; you could enter a mathematical expression into a cell that is expecting text data but you would not get a numerical answer. This is an important distinction for you to grasp. If for example you enter 2*23 into a numerical cell THE CRACKER will realize that it is expected to work out the answer and display it. Entering exactly the same thing into a text cell will simply cause "2*23" to be displayed in the cell.

Text is used for headings, explanatory labels or for information in a database, such as names and addresses. THE CRACKER assumes that you may want to enter numbers and formulae into these cells as part of an explanation of the surrounding sheet so no attempt is made to calculate using these values.

On first loading THE CRACKER, the entire sheet is given a default left justified text format and a General numeric format which is like a scientific calculator.

Text data can NOT be entered into a cell that has been set up with a numeric format.

It is possible to use the EDIT command to change data to the wrong format, but you will find that the error will be pointed out to you as soon as you leave the Edit mode. Pressing the [DEL] key will return you to edit mode to correct your mistakes.

Data can be assigned to an incorrectly formatted cell if it has been loaded in from a disk file onto an existing sheet. However, any attempt at performing a calculation on the data will generate an error.

THE CRACKER TUTORIAL II
The difference between text and number data

Some of THE CRACKER's inbuilt functions and expressions work on a specified range or column of the data. For example, to AVERAGE a section of data you would specify the range thus

AVERAGE (B1...B10)

Any cells that conform to an incorrect format, for example text, that fall within this range, or any blank cells are ignored in the above calculation. This saves you from having to create unnecessarily complicated expressions in order to encompass all of the data required.

FORMATS: CHANGING THE WAY THE DATA IS DISPLAYED

You will remember that the format does not affect the actual data value that a cell holds, just the way it is displayed on screen. You can therefore change a numeric cell from decimal format to integer and back again without losing any precision of the data. Whilst you are moving around the sheet, the contents line at the top of the screen will always show the data or expression of the current active cell exactly as it was originally entered, regardless of the current format.

For example if you have entered a cell value of 2.5345 this value will be shown on the contents line and used in any calculation regardless of the type of format used for the display. This can result in apparent calculation errors, for example in integer format, which displays whole numbers only, two times the above value would appear to give the result that $2 * 2 = 5$. A true integer calculation can be forced by using a function such as INT() in the calculation formula. You will learn more about functions very soon.

Before you can enter data or formulae, you will be prompted to state which format type should be used for that particular cell. To save time it is possible to assign a default format for the whole sheet or any column within it. The default format will be automatically used unless you specify otherwise - individual cells can still be assigned format types of their own.

So far you have only seen the G for General format in expressions and TL (Text Left justified) for text.

If you are still unclear about what is meant by changing the type of display consider this example. If you have a number such as 2 there are several ways you could write it down, such as 2, 2.0, 2.000, 0.2E1. All are perfectly valid, but not all appropriate for presentation in a report, or for immediate legibility. If the number referred to a quantity of stock items you would want 2; if it was the amount of money you would want 2.00, and if it was a laboratory test result you may want to infer a precision to the nearest 0.1 by using 2.0.

You can produce any of the above layouts using the various formats available with THE CRACKER. The full list of available numerical format types is:

- G General, rather like a scientific calculator
- ££ Finance, balance sheet format (£ is no. places shifted)
- £D Decimal places specified (£ is no. places)
- £E Exponent scientific notation (£ is no. sig. figs.)
- I Integer, nearest whole number
- P Plot format, horizontal bar graph

Text formats can be

- TL - text left justified
- TR - text right justified
- HE - heading

There is also a default format choice of Carriage Return that can be assigned to individual cells or ranges. For example, these can be used to control printout in such a way that address labels can be produced. No data should actually be entered in cells that that have this format.

More on Numeric formats

You can now experiment with some different formats. Go to cell B1 and type FG<R> which means 'make this cell General Format':

B1	(36.9)						B16
Gen							65476
Next:	Format to be General	<R>					Auto.
1	First number	A					
2		<				36.9>	
3							
4						38.9	
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

Note that at this stage you are put immediately into Entry mode ready to enter data into the cell.

Because you have chosen a numeric format the type of prompt you will receive will reflect this i.e. Enter a number or an expression.

Type 2<R>:

```

B1 (36.9) B16 65476
Gen Enter number or expression Auto.
-->> 2
1 First number A B 36.9>
2 38.9
3
4
5
6
7
8
9
10
11
12
13
14
15
16
    
```

You will see that your value of 2 is displayed as 2.

The F for Format command should only be used on cells where you wish to change the data in the cell, although it is also possible to change the format of an existing entry without having to re-enter the data. Without moving the cell cursor type the following and watch the changes: NF4<R> for 'New Format 4 places Decimal':

```

B1 (2) B16 65479
Gen Next: Format to be 4 places Decimal Auto.
-->> 2
1 First number A B 2>
2 4
3
4
5
6
7
8
9
10
11
12
13
14
15
16
    
```

```

B1 (2) B16 65479
4Dec Next: ABCDEFGIJLHOPRSTUVWXZ!+-\>./(*^ arrows Auto.
-->> 2
1 First number A B 2.0000>
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
    
```

Type NF0F<R> for 'New Format, no shifted places, Financial':

```

B1 (2) B16 65479
OFIn Next: ABCDEFGIJLHOPRSTUVWXZ!+-\>./(*^ arrows Auto.
-->> 2
1 First number A B 2.00 >
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
    
```

The Financial format will put commas into the numbers as they get larger. Negatives will be enclosed in brackets.

Type NFI<R> for 'New Format Integer':

```

B1        B16
Int       65479
Next:    Auto.
(2)
ABCDEF GHIJKLMNOPQRSTUVWXYZ!+~>.(/* arrows
A         <----->
1 First number
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

```

Now try NF6ER> 'New Format 6 significant figures Exponent' notation:

```

B1        B16
6Exp     65479
Next:    Auto.
(2)
ABCDEF GHIJKLMNOPQRSTUVWXYZ!+~>.(/* arrows
A         <----->
1 First number
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

```

It is important to remember that however you display a value there is no change in the way the number is stored by THE CRACKER. Formatting does not change the value that you have entered or calculated, just how it is laid out on the screen or printed on paper.

Text Formats

There are two normal types of text entry, the first of which is justified within the column width. This type has two subdivisions - you can specify that you want the text to be left justified (it hugs the left hand side of the column) or right justified (it hugs the right hand side of the column).

The second type of text entry is Heading. This type will overwrite the next column if there is not enough space to display all of the information in its proper place. As the name suggests, this is most useful when entering explanatory titles or headings that you want to be displayed regardless of any changes in the various column widths on screen.

Try an experiment with the various text types. Move the cursor back to A1. Type FTL<R> which stands for 'Format - Text Left justified' and you will see:

```

A1        B16
Text     65479
Next:    Auto.
(2)
ABCDEF GHIJKLMNOPQRSTUVWXYZ!+~>.(/* arrows
A         <----->
1 First number
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

```

Type a few characters such as "Test text" followed by <R> and your entry will be transferred to the worksheet to replace the previous entry. Up to the point where you pressed <R> you could have pressed [ESC] and got this previous entry back.

```

B16
65479
Auto.

A1 First number
Tx1L Enter Characters
Next: Test text
1<First number A
2 >
3 B
4 0.200000E+01
5 4
6
7
8
9
10
11
12
13
14
15
16
    
```

Note that the figure for the remaining memory will have changed. To correspond with the format choice you have made the new entry is displayed on the left of the cell:

```

B16
65482
Auto.

A1 Test text
Tx1L ABCDEFGIJLHNPORSTUVWXZ!+-\>.{!* arrows
Next:
1<Test text A
2 >
3 B
4 0.200000E+01
5 4
6
7
8
9
10
11
12
13
14
15
16
    
```

Type NFR<R>, which stands for 'New Format Text Right justified', to see the effect of changing the format to right justification without losing the data.

```

B16
65482
Auto.

A1 Test text
Tx1R ABCDEFGIJLHNPORSTUVWXZ!+-\>.{!* arrows
Next:
1< Test text> A
2
3 B
4 0.200000E+01
5 4
6
7
8
9
10
11
12
13
14
15
16
    
```

Before investigating Heading format you are going to change the column width. Type NW4 <R> which stands for 'New Width 4'.

```

B16
65482
Auto.

A1 Test text
Tx1R ABCDEFGIJLHNPORSTUVWXZ!+-\>.{!* arrows
Next:
1<Test> A
2
3 B
4 0.200000E+01
5 4
6
7
8
9
10
11
12
13
14
15
16
    
```

You should note that only the word "Text" can be displayed in the available space, now that we have made the column much narrower. The whole entry is still there in the worksheet memory, as you can see by looking at the contents line at the top.

If you type NFK<R> for 'New Format Heading' you will change the cell display thus:

```

A1  Test Text      B16
    Head  ABCDEFGIJKLMNQRSTUWXYZ!+~>./(* arrows  55482
    Next: A 0.200000E+011                          Auto.
1<Test Text
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
    
```

The whole of the "Text test" is again displayed and part of it overwrites the start of cell B2.

While entering text you can backspace using the [DEL] key, or press [ESC] to abandon the whole process. This does not destroy what you had in the cells before you started the new entry.

Recap: You have learnt that data falls into two broad subdivisions, text and numeric. We have then looked at some of the format subdivisions within those two types, that control the way the data is displayed on screen.

More on changing the layout.

MORE ON CHANGING COLUMN WIDTHS AND FORMATS

You have already used the New command several times to change the column width and to change the format, it can also be used to change the default column format. The default column format is the format that will always be used in your current column if you do not declare a particular one before each entry. The last item that may be changed with this option is the global format. Despite the singular name, this is a preset pair of formats - one for text and the other for expressions. These may be used anywhere on your worksheet and are quicker to call up than by explicitly stating which format type you require for each entry. You can call these formats instantly by using the "(" command for numerical expressions and the ")" command for text. At startup these formats are set to General for numerical expressions and Text Left Justified.

If the vast majority of your worksheet is likely to use one format then it will be worth your while redefining the Global format.

The complete set of New commands is:

- NWE New column width (£ is no. spaces width)
- NF New format to be...
- ND New default format to be...
- NG New global format to be...

You haven't seen the Global format in operation yet and so here are a couple of examples. Type ZA<R><R> to clear the sheet then IC20<R>IL<R> to set up a single cell with a column format of Text Left Justified.

If you typed '.' for Entry mode then you would be able to enter some text at this cell, but what if you wanted to enter a number? You could change the default column format, you could explicitly state the desired format using the F command or you could use the Global expression entry method. To do this just type '(' and you can immediately enter a numerical expression.

```

A1  Enter number or expression      A1
Gen >> A                            65519
1<                                     Auto.
1<                                     >
    
```

Note that the current Global cell format for numeric data is General. Remember this can be changed using the NEW COMMAND.

The operation is very similar if you want to put text in a column that is set up for a number. This time use the single quote to set it up for a Global text entry.

```

AI 65516
Txl Enter characters
>>
A
1<

```

You can use the Global format entry method anywhere on your worksheet.

You can of course also change the Global text format using the NEW command.

Remember that you cannot use the New Format command for changing between text and numeric formats if the cell already contains data.

Even if you have managed to get the wrong type of data into a cell, using the Edit command or by loading a file in, you still cannot change the Format between text and numeric in order to suit the data. You will have to blank the entry and then rewrite what is there AFTER changing the format.

Recap: You have looked at how existing data can have its display format changed. We also have seen how the global format can be used to quickly set up cells for a certain data type.

EDITING

We have seen already how easy it is to replace the contents of a cell with something different, and for most operations you will find that this is the most convenient method to use for making changes. However, sometimes you may wish to make only minor modifications to an existing entry and for long and complex expressions it would be more convenient just to edit the existing information.

To change an entry without re-entering it use THE CRACKER's cell editing commands. These allow you to add, delete (zap) or change characters in an entry. The editor may be used for both text and expression entries.

As an example, prepare a line of characters that can be edited. Clear the sheet, type IC20<R>I<R> then key ',' followed by some characters, e.g. "ABCDEFGHJKLMNQP". You should see this line of letters appear in the cell when <R> is typed.

```

AI 65517
Txl Enter characters
>> ABCDEFGHJKLMNQP
A
1<

```

Now type E<R> to get into the Edit mode:

```

AI 65502
Txl ABCDEFGHJKLMNQP
Next: Edit
A
1<ABCDEFGHJKLMNQP

```

As you can see, the contents of the current cell are displayed and a list of editing options is shown. These consist of insert, exchange, Zap (delete), spacebar to move the cue right, [DEL] to move left, and <R> to leave the edit mode. Press the space bar 5 times and then type I for insert:

```

AI 65502
Txl ABCDEFGHJKLMNQP
Edit: ABCDEFGHJKLMNQP
A
1<ABCDEFGHJKLMNQP

```

A space is opened up on the edit line, at the cue position, for you to insert your new character. Type "-" and you will see it inserted and a new space opened up for you.

```

AI  ABCDEFGHIJKLMNOP
   "insert" char.<DEL>.<R>.<R>.arrow
TxTL ABCDE FGH IJKLMNPO
Edit: ABCDE/FGHIJKLMNPO
      A
1<ABCDEFGHIJKLMNPO >

```

Type <R> to leave the insert mode and you will be returned to the main edit prompt.

Now press the [DEL] key to go back one space:

```

AI  ABCDEFGHIJKLMNPO
   I.X.Z.space.<DEL>.<R>.<R>.arrows
TxTL ABCDE-FGHIJKLMNPO
Edit: ABCDE-FGHIJKLMNPO
      A
1<ABCDEFGHIJKLMNPO >

```

This time take option X and you enter exchange mode, which as you may have guessed, is for replacing part of the entry with something different:

```

AI  ABCDEFGHIJKLMNPO
   "Xchange" char.<R>
TxTL ABCDE-FGHIJKLMNPO
Edit: ABCDE-FGHIJKLMNPO
      A
1<ABCDEFGHIJKLMNPO >

```

Type "/" and you will see it replace the "-".

```

AI  ABCDEFGHIJKLMNPO
   "Xchange" char.<R>
TxTL ABCDE/FGHIJKLMNPO
Edit: ABCDE/FGHIJKLMNPO
      A
1<ABCDEFGHIJKLMNPO >

```

Now type <[DEL]> and the cue will go back one space again.

Use <R> to go back to the main edit prompt:

```

AI  ABCDEFGHIJKLMNPO
   I.X.Z.space.<DEL>.<R>.<R>.arrows
TxTL ABCDE/FGHIJKLMNPO
Edit: ABCDE/FGHIJKLMNPO
      A
1<ABCDEFGHIJKLMNPO >

```

The other option you have while editing is character deletion. Type Z and you enter Zap mode:

```

AI  ABCDEFGHIJKLMNPO
   "zap" space.<R>.<R>.arrow
TxTL ABCDE/FGHIJKLMNPO
Edit: ABCDE/FGHIJKLMNPO
      A
1<ABCDEFGHIJKLMNPO >

```

To delete a character or string of characters just press the space bar once for each deletion. In this case the "/" will immediately disappear.

```

AI  ABCDEFGHIJKLMNPO
   "zap" space.<R>.<R>.arrow
TxTL ABCDEFGHIJKLMNPO
Edit: ABCDEFGHIJKLMNPO
      A
1<ABCDEFGHIJKLMNPO >

```

Note that the Zap feature works on the character that the cue is currently on. Leave the Zap mode by pressing <R> and you return for the final time to the main edit prompt. To leave the editor type <R> for a second time:

```

AI  ABCDEFGHIJKLMNPO
   ABCDEFGIJKLMNOPQRSTUVWXYZ!+~>.<R>.<R>.(*arrows
TxTL ABCDEFGIJKLMNOPQRSTUVWXYZ!+~>.<R>.<R>.(*arrows
Edit: ABCDEFGIJKLMNOPQRSTUVWXYZ!+~>.<R>.<R>.(*arrows
      A
1<ABCDEFGHIJKLMNPO >

```

At any stage up to this point you could have pressed the [ESC] key. This abandons the changes you have made and retrieves the entry in the form it was before you entered the edit mode.

Recap: You have seen how long and complex expressions can be edited rather than simply overwritten. However there is a price to pay in the temporary loss of error checking.

REMOVING DATA FROM THE SHEET - BLANKING AND ZAPPING

We have already seen how to reduce the size of the sheet by zapping specified rows and columns, you will now see that it is also possible to remove data from specified areas of the sheet WITHOUT changing the physical size of the grid.

Let us recap on the Zap command. This command works on specified lines or columns, either individually or collectively. It not only removes the data from the cells in question, but also reduces the size of the sheet. The lines or columns that are removed need not be on the outer edges of the sheet, but you are prompted to specify which rows and columns to remove - the remaining cell coordinates will automatically adjust themselves to reflect the change.

However, cells cannot be zapped if there are other formulae that depend on the data held within. If you try to do so you will be offered the chance to use the BLANK option instead.

If you are sure you want to Zap a column or line that has data dependent on it, you must first find and zap or blank all of the cell formulae that depend on the value held in the target cells. This is more simply done than it may first seem because the Cracker will tell you which are the dependent cells in turn.

BLANKING

You can use the Blank command to clear all, or parts, of the worksheet. In contrast to the Zap command you will not change the size of the sheet or any of the default settings with this option. However, individually defined commands - such as formats - will revert to the default column settings.

A little thought should soon demonstrate why this is the only option available that will allow you to delete specified individual cells and blocks - data can be removed without creating a 'hole' in the defined sheet. Even though you are allowed to use the Zap command on such cells, the effect achieved is exactly as if Blank had been used instead.

As an example you will see how to use the block option in more detail. Create a new sheet of say, three columns by four lines, each containing some text or numeric constant data. Type BBAL.B2<R> which stands for 'Blank Block of the range A1 to B2. Note that you are allowed to type a single period to specify a range but THE CRACKER automatically expands this to three for clarity.

THE CRACKER TUTORIAL II
Removing data from the sheet

```

A1 ABCDEF0HIJKLHNP
Text: Blank block A1...B2
Next: Blank block A1...B2
C
1<ABCEFGHIJKLHNP
2 ABCDEF0HIJKLHNP
3 ABCDEF0HIJKLHNP
4 ABCDEF0HIJKLHNP
5 ABCDEF0HIJKLHNP

```

C5
65264
Auto.

```

A1 ABCDEF0IJKLHNPQRSTUVMWZ:++\>.<.* ations
Gen:
Next:
1<
2 ABCDEF0HIJKLHNP
3 ABCDEF0HIJKLHNP
4 ABCDEF0HIJKLHNP
5 ABCDEF0HIJKLHNP
C
ABCDEF0HIJKLHNP
ABCDEF0HIJKLHNP
ABCDEF0HIJKLHNP
ABCDEF0HIJKLHNP
ABCDEF0HIJKLHNP

```

C5
65332
Auto.

Now remove the rest of the worksheet with BE<R> (Blank Entry) on B3 and B4 and BC<R> (Blank Column) on column C.

You will never be allowed to inadvertently destroy the sense of the sheet with the Blank command. If you have an entry like 2*B3 and try to blank B3 THE CRACKER will check and warn you. However, you will be allowed to confirm that you wish to blank the cell. A row of '???' will then appear in the cell at every recalculation to signal to you that some data is missing from the sheet. Depending on the formulae that refer to the blanked cell you may also trigger other errors such as 'Division by zero'.

Recap: You have learned how to reduce the size of the sheet using Zap and how to erase entries using Blank.

THE CRACKER TUTORIAL
III. EXPRESSIONS

UNDERSTANDING EXPRESSIONS - THE HEART OF THE SHEET

We have already looked in brief at entering expressions in the first part of the Tutorial. You will not be surprised to find that there is very much more to expression formulae than that. However, it is best to take it slowly, experimenting with each new feature and finding those that suit your particular needs. By selecting the appropriate formula for a given application, THE CRACKER can be made to do all the hard work.

For example, in a financial report we may have an entry for yearly income, one for costs and one for profit. We understand that the value that represents profits is worked out as Income minus Costs. When using THE CRACKER we should enter only the data for income (in cell A1 for example) and for costs (e.g. cell B1), in the third cell we then enter the relationship between these two that represents profits in the form of a formula (A1-B1). The technical term for this formula is an expression.

The power of the spreadsheet lies in the fact that you can enter extremely complex formulae and inter-relationships between the cells, but as soon as you make a change to one entry the full repercussions of the change can be calculated and the entire sheet almost instantly updated. An expression is defined as any entry that can be used to calculate a value.

What are the features of an expression? We have said you may think of it as a mathematical formula. 2+2 is an expression which should equal 4. 2+A1 is also an expression which as you have already seen is equal to 2 plus whatever is the value of A1. You can use any of the following mathematical signs, known correctly as operators:

- + plus
- minus
- * multiply
- / divide
- ^ to the power of
- % percent

The + and - signs you will of course be familiar with, but if you are new to computing the symbols *, / and ^ may be unfamiliar. You will always have to use the ^ symbol when you want to get 'to the power of' because super scripts are not available. The % symbol is not often used in calculations outside of spreadsheets, it means 'percent' such that 5\$20 is 5 percent of 20. '*' is the multiplication symbol (eg 5*2=10) and '/' the division symbol (eg 10/2=5).

Now we will consider entering formula into a cell. You may already be wondering how to enter the formula on one line when usually they take up 2 or more if written out longhand. This is simply done by splitting the formula into parts and enclosing these in brackets (). To show that one part is divided by another we put / between them, so:

'2+A1' becomes (2+A1)/(5+A2).

5+A2

This is a common computing convention and will be familiar to anyone who has used a programming language such as BASIC. If necessary, you can have several layers of brackets to avoid ambiguities. If THE CRACKER finds a reference to a cell that does not have a value it will use 0. This is useful feature that allows you to use a range of cells in some functions without worrying whether they all have the correct form of data.

THE CRACKER works out expressions in normal algebra, ie. the algebra you use in manual calculations. Some people with experience in computing may be relieved to hear that the back to front entry method (reverse polish notation) is not used.

THE CRACKER understands the correct order of precedence of the operators during calculation. In general make up formulae as you would for pencil and paper, convert them to one line form and enter them into a cell and the result will come out as you intended.

On many spreadsheets there is no inbuilt order of precedence; 1+2/5 would be worked out to be 0.6 which is not the correct result (1.4). On these sheets you have to take positive action to force a correct result by entering 1+(2/5). You will have no such problems when using THE CRACKER. The order of precedence of calculation is:

- ()
 - { }
 - ^
 - * and /
 - + and -
 - >, < and =
 -], [and |
- these are logical operators.

THE CRACKER starts the calculation with the innermost brackets. Within the brackets it works out the part of the expression starting with the highest precedence operator. Where there are two operators of equal precedence the one on the left is done first. The next bracket is then done and so on. Do not worry about the details if this is unclear, just make up your expressions in your usual way.

The other item you can use in an expression is a function. This is a built in formula that can be called by a simple name and which will return a value to your expression. The simplest function is PI which when used in calculations gives the value 3.14159265358979 without having to enter it.

For example:

```

A1      Enter number or expression
Gen    >> 2*pi
1<
2
3
4
5
A      >
B      |
C      |
C5     65519
Auto.
    
```

```

A1      (2*pi)
Gen    ABCDEFGIJKLMNOPQRSTUVWXYZ:--\>.(('* arrows
Next:
1<      A      6.28318530717959>
2
3
4
5
A      >
B      |
C      |
C5     65504
Auto.
    
```

There are also some functions into which you must first insert a value. An example is SIN(30) which means 'work out the sine of 30 degrees'. Note that the value you enter into the function must be enclosed in brackets:

```

A1      Enter number or expression
Gen    >> sin(30)
1<
2
3
4
5
A      >
B      |
C      |
C5     65519
Auto.
    
```

```

A1      (sin(30))
Gen    ABCDEFGIJKLMNOPQRSTUVWXYZ:--\>.(('* arrows
Next:
1<      A      0.5>
2
3
4
5
A      >
B      |
C      |
C5     65501
Auto.
    
```

One feature you will find especially useful is that you can have 2*15 or 4*A1 or any other expression in the brackets part of the function. The part within the brackets is calculated first and then the result is fed to the function. You can even have functions of functions such as SIN(SIN(30)) and so on. There are no real restrictions except the number of levels of brackets, which is limited to five in any one expression.

For example:

```

A1      Enter number or expression
Gen    >> sin(sin(30))
1<
2
3
4
5
A      >
B      |
C      |
C5     65519
Auto.
    
```

```

A1      (sin(sin(30)))
Gen    ABCDEFGIJKLMNOPQRSTUVWXYZ:--\>.(('* arrows
Next:
1<      A      0.0087265349837393>
2
3
4
5
A      >
B      |
C      |
C5     65496
Auto.
    
```

The last type of function is the one which has two or more values enclosed in (). These enclosed values are called ARGUMENTS. For example SUM(2,3) adds all the values separated by commas in the brackets. This function returns a value of 2+3 or 5. Try these functions for yourself:

```

A1      Enter number or expression
Gen    >> sum(2,3)
1<
2
3
4
5
A      >
B      |
C      |
C5     65519
Auto.
    
```

```

A1 (sum(2,3))
Gen ABCDEFGIJKLMNOPQRSTUVWXYZ+-\>/>.<('* arrows
Next:
1<
2
3
4
5
C5 45500
Auto.

```

You can have as many parts inside the brackets as you like. Here is an example with three arguments:

```

A1 (sum(2,3,4))
Gen >> sum(2,3,4)
Next:
1<
2
3
4
5
C5 65519
Auto.

```

```

A1 (sum(2,3,4))
Gen ABCDEFGIJKLMNOPQRSTUVWXYZ+-\>/>.<('* arrows
Next:
1<
2
3
4
5
C5 65498
Auto.

```

The values could also be expressions:

```

A1 (sum(2+3,4,5))
Gen >> sum(2+3,4,5)
Next:
1<
2
3
4
5
C5 65519
Auto.

```

```

A1 (sum(2+3,4,5))
Gen ABCDEFGIJKLMNOPQRSTUVWXYZ+-\>/>.<('* arrows
Next:
1<
2
3
4
5
C5 65496
Auto.

```

You can see the full list of functions in the EXPRESSION ENTRY section of the command reference further on in the manual.

If you want to enter a function such as SUM(A1,A2,A3,A4) to add the cells from A1 to A4 you can use the shorthand SUM(A1...A4). A1...A4 is a range meaning use all the values between the first coordinate and the second. You only have to enter the first period and THE CRACKER will add the other two for clarity; you just type A1..A4.

You can even use the function in the form SUM(A1...A4,B7). Use a range anywhere you would otherwise put a list of adjacent entries. For most functions, the range will still work if one or more of the entries is a blank - this is because the functions only work on the non-blank cells.

These then are what makes expressions. There are just two more facilities you might find useful. The first is the £ symbol which when used after a coordinate puts its value into the worksheet. £ will therefore actually put the value of A1 into the expression rather than the cell coordinate 'A1'. If you type £ and A1 is 3 you will find your expression becomes 2+3.

This means that if you later change the value that is held in cell A1 it will make no difference to your new expression.

Let us try this out:

```

A2 Enter number or expression
Gen >> 2+£A1
Next:
1 1
2 >
3
4
5
C5 65507
Auto.

```

Instantly becomes:

```

A2 Gen Enter number or expression
   >> 2+3
1 1
2 <
3 3
4 4
5 5
A B C
| | |
| | |
| | |
| | |
| | |
C5 65507
   Auto.
    
```

The other facility is the ! symbol which forces the expression you are entering to be replaced by its value up to that point. So if you type 2+3! the display will immediately convert to 5 and you can continue the entry from that point. Again if you force a value that includes some cell references e.g. 2*B3 this is replaced by a numerical constant and the value will not change even if B3 is altered.

```

A1 Gen Enter number or expression
   >> 2+3
1 <
2 2
3 3
4 4
5 5
A B C
| | |
| | |
| | |
| | |
| | |
C5 65519
   Auto.
    
```

Instantly becomes:

```

A1 Gen Enter number or expression
   >> 5
1 <
2 2
3 3
4 4
5 5
A B C
| | |
| | |
| | |
| | |
| | |
C5 65519
   Auto.
    
```

Or you could try it again with an expression:

```

A2 Gen Enter number or expression
   >> 10*A1
1 1
2 <
3 3
4 4
5 5
A B C
| | |
| | |
| | |
| | |
| | |
C5 65507
   Auto.
    
```

```

A2 Gen Enter number or expression
   >> 5!
1 <
2 2
3 3
4 4
5 5
A B C
| | |
| | |
| | |
| | |
| | |
C5 65507
   Auto.
    
```

Both of these commands have the effect of making the expressions independent of changes in the referenced cells.

THE ORDER OF CALCULATION

A powerful feature of THE CRACKER is that it does not matter where in the spreadsheet you enter your data or expressions. If you have used other spreadsheets before, you will appreciate the difficulties of getting all your calculations in the right order and avoiding forward references.

As you enter an expression THE CRACKER gives it an 'order of calculation number'. This is not affected by where you enter the expression, just by the references in the formula. If you enter 2*B1 into A3, for example, then you know that you want the 2*B1 to be calculated before A3 otherwise it does not make sense. THE CRACKER goes through all the expressions as you enter them, working out which is the correct order for calculation. If the entry is a constant then it does not have an 'order of calculation number'.

This feature allows you to rearrange the sheet as you like without affecting your calculated values. The operation is entirely automatic so you don't have to worry about it.

You will be able to see the calculation numbers displayed in angled brackets if you use the X for exchange command. Those cells which contain a low order of calculation number are calculated before those with a high number.

Recap: We have looked at some of the possible expressions that can be entered into THE CRACKER - these expressions make Cracker such a powerful tool.

Each expression is assigned a number that tells THE CRACKER which order they should be calculated in.

THE CRACKER
Mathematical Functions

MATHEMATICAL FUNCTIONS

Here is a more detailed list of the various mathematical functions available. Again you need not worry about those functions you are unlikely to use. This tutorial is designed to show what functions are available in THE CRACKER and how to use them - there will be no attempt to explain the meaning of the mathematical terms available.

Remember as you read that arguments are what you put in brackets after the function name and which the function is expected to use to work out its current value.

The usual trigonometric functions are available and there are two versions of each for degrees and radians. The functions SIN, COS, TAN, ASIN, ACOS and ATAN refer to degrees. Those with A in front represent the inverse functions.

SINR, COSR, TANR, ASINR, ACOSR and ATANR are the equivalent functions using radians. Each function takes just one argument enclosed in brackets.

So that you can see what is going on with this screen example, the expressions in column B have been copied into column A in text form, remember that although the two look the same the text column contains only 'words' which cannot be calculated.

BL4	Next:	A	B	BL5
1	SIN(30)	0.5	0.707106781186548	65159
2	COS(45)	0.707106781186548	1.73205080756888	Auto.
3	TAN(60)	1.73205080756888	11.5369590328155	
4	ASIN(0.2)	11.5369590328155	72.5423968762779	
5	ACOS(0.3)	72.5423968762779	26.565051177078	
6	ATAN(0.5)	26.565051177078		
7				
8	SINR(PI/6)	0.5	0.707106781186548	
9	COSR(PI/4)	0.707106781186548	1.73205080756888	
10	TANR(PI/3)	1.73205080756888	0.203373720790331	
11	ASINR(0.2)	0.203373720790331	1.2861036727795	
12	ACOSR(0.3)	1.2861036727795	0.463647609000606	
13	ATANR(0.5)	0.463647609000606		
14				
15				

The natural logarithm is referred to as LN and the base 10 logarithm is LOG10. The natural antilogarithm is defined mathematically as e^x (the exponential constant e multiplied to the power of x) and is referred to as EXP. The equivalent base 10 antilogarithm must be obtained by using 10^x where x is the value for which you want the antilogarithm.

The exponential constant e is available as a function without an argument, e (lower case is essential when you type this), similarly, π is available.

The square root is called with SORT.

```

B15      B15
Gen      65335
Next:    Auto
1        A      LN(3.5)  1.252762968495371
2        B      EXP(B1)  3.5
3        LOG10(23.5)  1.371067862271741
4        10*B3      23.5
5        PI
6        PI
7        PI
8        SORT(2)  1.4142135623731
9
10
11
12
13
14
15
    
```

UTILITY FUNCTIONS

SUM, minimum and maximum, available as SUM, MIN and MAX will scan a list and return the relevant value. COUNT will find the number of non-blank entries in a list. All these functions are of the form FUNC(list).

SUMIF is a conditional adding up function. Only those items in the range will be added that have an entry in a corresponding adjacent column. You can therefore selectively mark which items in the range are to be included.

	A	B
1		123.45
2	MARKER	23.45
3		245.56
4	MARKER	45.67

SUMIF(A1..B1..B4) gives 69.12
SUM(B1..B4) gives 438.13

BLEEP Sets off a beep. Use it as an audible signal, especially useful for signalling results that are unusual within an IF-THEN function.

GROW takes two arguments, a value and a percentage. The effect of GROW is to cause a percentage increase to the value. The form is GROW(value,percent). Despite the name, the percentage can be negative.

The remaining functions in this section all act on a single argument and are of the form FUNC(value).

The ABS absolute value of an argument is the value ignoring the sign.

POS returns the value of the argument if it is positive but zero if it is negative. This is useful in tax calculations.

The integer or non-decimal part of a number can be obtained with the function INT or, if you want the nearest whole number, use NINT. The decimal part of a number is given by the function DPART.

ROUND is a useful function that will round a value to 2 decimal places. NOTE this is very different from most of the functions in that it puts the rounded value back into memory and the original value is lost. You may need this function in complex financial calculations which otherwise would not balance because fractions of a penny (cent etc.) are having an effect.

RND returns a true integer random number between 0 and 127. (This only works on computers with Z80 processors as the value is taken from the refresh counter of the processor).

```

A21      ABCDEFGIJLMNOPQRSTUVWXYZI+-\>.( '* arrows
TxTr
Next:
1      A      SUM(3.2.5)      10
2      MIN(3.2.5)      2
3      MAX(3.2.5)      5
4      COUNT(3.2.5)      3
5      GROW(50.5)      52.5
6      ABS(-12)      12
7      POS(12)      0
8      POS(-12)      12
9      INT(23.55)      23
10     NINT(23.55)      24
11     DPART(23.55)      0.55
12     ROUND(23.248)      23.25
13
14
15     SUMIF(B18..C21)      4
16
17
18
19
20
21<
>

```

C21
65010
Auto.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21<
>

STATISTICAL FUNCTIONS

Permutation and combination can be calculated with PERM(n,r) and COMB(n,r) where n is the total number of items and r is the number to be combined or permuted. For factorial use FACT(value).

```

B4      ABCDEFGIJLMNOPQRSTUVWXYZI+-\>.( '* arrows
Gen
Next:
1      A      PERM(52.4)      6497400
2      COMB(52.4)      270723
3      FACT(9)      362880
4      <
5      >

```

B5
65429
Auto.

Standard deviation and variance and average all act on a list to complete your set of powerful statistical tools. These functions are called STDEV, VAR and AVERAGE. (See the magazine BYTE Nov 1983 pp560-563 for the method used).

```

A18     ABCDEFGIJLMNOPQRSTUVWXYZI+-\>.( '* arrows
TxTr
Next:
1      A      12.01
2      11.78
3      12.15
4      12.05
5      11.93
6      11.99
7      12.12
8      12.23
9      11.89
10     12.07
11
12     AVERAGE(B1..B10)      12.022
13     STDEV(B1..B10)      0.1324806547189
14     VAR(B1..B10)      0.017551111111111
15
16
17
18<
>

```

B1E
65236
Auto.

DEFINED FUNCTIONS

A defined function works in just the same way as an inbuilt function, except that it uses an expression that you have typed in yourself. It is therefore a way in which you can set up a complex formula once that you may want to use many times.

The function is a single cell formula that can be used by other cells and, of course, after defining it for the first time you do not have to write it out in full again. Consider the following formula which uses the value held in cell A1. If you had to write it out 50 or 100 times it would get very time consuming and also quickly use up your available memory.

Let us try an example - set up a sheet as so with a constant in A1, e.g 23.4.

B1	{0.789*(A1+3)}	B3	65481
Gen	ABCDEFIJKLMNQRSTUWXYZ!+>/>.(/* arrows	Auto.	Auto.
Next:			
1	A 23.4<	B	20.8296
2			
3			

To use a defined function, you only have to give the coordinate of the cell which contains the formula and follow it with another cell reference, to use as the value on which you want the function to operate. In this case the formula is in B1 and the value in A3. To call the function write the formula cell reference and follow it by a bracket just as if you were writing a built in function. Inside the brackets put either a constant or the coordinate of the cell with the value that you want passed to the function.

Now put a different constant, e.g. 18.9, in A3 and move to cell B3. This is the cell where we will call our defined function.

B3	Enter number or expression	B3	65466
Gen	>> B1(A3)	Auto.	Auto.
1	A 23.4	B	20.8296
2			
3			

THE CRACKER
Defined functions

In the defined function above you can read it as: Take the formula in B1 and replace the first cell reference found by A3. This is what is done.

If there is more than one cell referred to in the original formula then you must have extra arguments in brackets for the defined function to use. Note that if the same cell is referred to more than once in the formula then it must also be repeated the correct number of times in the argument list.

The number of arguments can be less than those in the formula. If this is the case the later cell references will remain unchanged from whatever they were typed in as when you first defined your formula. This can be useful.

B3	(B1(A3))	B3	65449
Gen	ABCDEFIJKLMNQRSTUWXYZ!+>/>.(/* arrows	Auto.	Auto.
Next:			
1	A 23.4	B	20.8296
2			
3			

In the example the formula has acted on A3 to give the answer 17.2791. It is important that the cell containing the formula for the defined function is kept separate from the rest of the sheet. This is because every time the formula is re-used, the cell values referred to by the original formula are changed to those given by you in the argument. If the value of the defined function cell was used in calculations by any other cell in the sheet unpredictable results will occur.

C3	Enter number or expression	C3	52691
Gen	>> C1(A3,B3)	Auto.	Auto.
1	(2)	(3)	<1> ((A1+B1)*56.7)
2			
3	(2)	(6)	<

The above is an example where there are two cell references in C1. As a reminder, to get this type of display just type X<R> and the formulae will be shown instead of the results. The defined function call will be made in C3:

```

C3      (C1(A3,B3))
Gen     ABCDEFGIJKLMNOPQRSTUVWXYZ\^>.( '* arrows
Next:
1       A          51          61          C          623.71
2       |          |          |          |          |
3       51         51         6<         |          623.7>
    
```

Note that the original values in A1 and B1 have been changed by the call.

You have now had an introduction to many of the functions that are available for use in your expressions, and you should be beginning to get an idea of the power of THE CRACKER. Later in this tutorial we will be coming back to look at some of the more advanced types of functions and expressions and what can be done with these.

First, however, there are some more basic commands that have to be dealt with so that you can become completely familiar with the housekeeping of your worksheet and how to manipulate the data.

Recap: We have looked in more detail at some of the many functions that are available to you. In particular mathematical and statistical functions, some general purpose utility functions and user defined functions.

THE CRACKER TUTORIAL
IV. MORE TECHNIQUES

REORGANIZING THE SHEET - COPY AND MOVE

USING THE MOVE COMMAND

You use the Move command to transfer parts of the sheet to another part of the work area.

Start with a blank worksheet (you should know how to do this by now). Fill up the four top left entries again using the '.' (Entry) command. Now type MEA1.B2<R> (Move Block of range A1 to B2):

```

C4      65451
Auto.
A1      ABCDEFGHIJKLMNOP
TxtL    . crd...crd <R>
Next: Move block A1...B2
1<      ABCDEFGHIJKLMNOP >B
2      ABCDEFGHIJKLMNOP |
3      ABCDEFGHIJKLMNOP |
4      |                  |
    
```

Now type JB3<R> (Jump to cell B3). The defined block will 'jump' with the cursor:

```

C4      65451
Auto.
A1      ABCDEFGHIJKLMNOP
TxtL    Up, Down, Left, Right, arrows, Jump, <R>
Next: Destination
1<      ABCDEFGHIJKLMNOP >B
2      ABCDEFGHIJKLMNOP |
3      ABCDEFGHIJKLMNOP |
4      |                  |
    
```

```

C4      65451
Auto.
A1      ABCDEFGHIJKLMNOP
TxtL    Jump to B3
Next: 0-9, <R>
1      ABCDEFGHIJKLMNOP |
2      ABCDEFGHIJKLMNOP |
3      ABCDEFGHIJKLMNOP |
4      |                  |
    
```



```

B3  ABCDEFHIJKLMNPO
TxTL ABCDEFGIJKLMNOPQRSTUVWXYZ!+>.<.* arrows
Next:
1  A | | | | |
2  | | | | |
3  <ABCDEFHIJKLMNPO >ABCDEFHIJKLMNPO
4  |ABCDEFHIJKLMNPO |ABCDEFHIJKLMNPO
C4  65451
    Auto.
    
```

Try the Move command with some of the other options, e.g. line and column. The only option not available with the Move command is ALL.

The Move command will overwrite any data in the destination area. Because there is therefore some danger of you mistakenly destroying the sense of any calculations on the sheet THE CRACKER will make a check to prevent this. However, remember it will let you overwrite some data if it appears that no other parts of the cell depend on it.

If there are any coordinate references in expressions being moved you will find these automatically adjusted in the new locations to take account of the new sheet layout.

The cells that are moved take their own format definitions with them.

You cannot move or copy cells outside the sheet as it is currently defined.

COPYING PARTS OF THE SHEET

As well as moving data from one part of the sheets to another it will probably come as no surprise that we can copy parts of the data.

Blank the sheet again. Type I3C15<R>TR<R> for 'Insert 3 Columns of width 15, Text, Right justified format' then I3L<R><R> for 'Insert 3 lines'. Then type ',' and put in the entry "ABCDEFHIJKLMNPO".

```

A1  ABCDEFHIJKLMNPO
TxTL 0-9, <R>
Next: Copy entry
1  A | | | | |
2  | | | | |
3  > | | | | |
4  | | | | |
B  | | | | |
C  | | | | |
C4  65502
    Auto.
    
```

Now let us use the Copy Entry command sequence. In this case use the arrows to move the cursor right when asked for the destination:

```

A1  ABCDEFHIJKLMNPO
TxTL Up, Down, Left, Right, arrows, Jump, <R>, File, Print, Mail label 65502
Next: Destination
1  <ABCDEFHIJKLMNPO > | | | | |
2  | | | | |
3  | | | | |
4  | | | | |
B  | | | | |
C  | | | | |
C4  65502
    Auto.
    
```

```

B1  ABCDEFHIJKLMNPO
TxTL ABCDEFGIJKLMNOPQRSTUVWXYZ!+>.<.* arrows
Next:
1  ABCDEFHIJKLMNPO > | | | | |
2  | | | | |
3  | | | | |
A  | | | | |
B  <ABCDEFHIJKLMNPO > | | | | |
C  | | | | |
C3  65485
    Auto.
    
```

THE CRACKER TUTORIAL IV.
Copying sections of the sheet

Now Copy Column. Move the cursor right:

```

A2  ABCDEFGHIJKLMNOP
TxTL 0-9, <R>
Next: Copy column
      A  |ABCDEFGHIJKLMN
      B  |ABCDEFGHIJKLMN
      C  |
1  ABCDEFGHIJKLMN
2 <ABCDEFGHIJKLMN
3

```

```

A2  ABCDEFGHIJKLMN
TxTL Up, Down, Left, Right, arrows, Jump, <R>, File, Print, Mail label 65451
Next: Destination
      A  |ABCDEFGHIJKLMN
      B  |ABCDEFGHIJKLMN
      C  |
1  ABCDEFGHIJKLMN
2 <ABCDEFGHIJKLMN
3

```

```

A2  ABCDEFGHIJKLMN
TxTL ABCDEFGIJKLMNOPQRSTUVWXYZ!+-\>.{* arrows
Next:
      A  |ABCDEFGHIJKLMN
      B  |ABCDEFGHIJKLMN
      C  |
1  ABCDEFGHIJKLMN
2 <ABCDEFGHIJKLMN
3
4

```

THE CRACKER TUTORIAL IV.
Copying sections of the sheet

Now let us try Copy Line. Move the cursor down for the destination:

```

B1  ABCDEFGHIJKLMN
TxTL 0-9, <R>
Next: Copy line
      A  |
      B  |
      C  |
1  ABCDEFGHIJKLMN
2 <ABCDEFGHIJKLMN
3

```

```

B1  ABCDEFGHIJKLMN
TxTL Up, Down, Left, Right, arrows, Jump, <R>, File, Print, Mail label 65485
Next: Destination
      A  |
      B  |
      C  |
1  ABCDEFGHIJKLMN
2 <ABCDEFGHIJKLMN
3

```

```

A2  ABCDEFGHIJKLMN
TxTL ABCDEFGIJKLMNOPQRSTUVWXYZ!+-\>.{* arrows
Next:
      A  |
      B  |
      C  |
1  ABCDEFGHIJKLMN
2 <ABCDEFGHIJKLMN
3

```

Now try Copy Block defining the block as a rectangle from cells A1...B2. Move the cursor down and across:

```

C2  ABCDEFHIJKLMNPO
TxTL ctd...ctd <R>
Next: Copy block A1...B2
1  ABCDEFHIJKLMNPO | ABCDEFHIJKLMNPO |
2  ABCDEFHIJKLMNPO | ABCDEFHIJKLMNPO |
3  | | | | | | | | | | | | | | | |
4  | | | | | | | | | | | | | | | |
C4  65417
    Auto.
    
```

```

C2  ABCDEFHIJKLMNPO
TxTL Up, Down, Left, Right, arrows, Jump, <R>, File, Print, Mail label 65417
Next: Destination
1  ABCDEFHIJKLMNPO | ABCDEFHIJKLMNPO |
2  ABCDEFHIJKLMNPO | ABCDEFHIJKLMNPO |
3  | | | | | | | | | | | | | | | |
4  | | | | | | | | | | | | | | | |
C4  65417
    Auto.
    
```

```

B3  ABCDEFHIJKLMNPO
TxTL ABCDEFHIJKLMNPOKSTUVWXZ:~>.</>.{/* arrows
Next:
1  ABCDEFHIJKLMNPO | ABCDEFHIJKLMNPO |
2  ABCDEFHIJKLMNPO | ABCDEFHIJKLMNPO |
3  <ABCDEFHIJKLMNPO | >ABCDEFHIJKLMNPO |
4  | | | | | | | | | | | | | | | |
C4  65349
    Auto.
    
```

In some ways the Copy command is the same as the Move command only the contents of the original location are not deleted. There is, however, one major difference; if you have coordinates in the expressions being copied you will be asked whether you want the references adjusted. If you answer "yes" and it is a row copy every reference to other locations on that row will be changed to take account of the new location.

You can try an example of an adjusted copy to get a feel for what is involved. Type ZA<R>Y<R> to completely clear the sheet and then I3C15<R>G<R> to put in three general format columns followed by I3L<R><R> to add some extra lines.

Type .2<R> to put 2 into location A1, move the cursor to B2 with R, then enter 2*A1<R>:

```

B1  Gen Enter number or expression
    >> 2*A1
1  A 2<
2  B >
3  C
4  |
C4  65507
    Auto.
    
```

Then type CL<R> for copy line:

```

B1  (2*A1)
Gen 0-9, <R>
Next: Copy line
1  A 4>
2  B
3  C
4  |
C4  65492
    Auto.
    
```

Followed by D to move the cursor down to the destination line:

```

B1  (2*A1)
Gen Up, Down, Left, Right, arrows, Jump, <R>, File, Print, Mail label 65492
Next: Destination
1  A 2<
2  B 4>
3  C
4  |
C4  65492
    Auto.
    
```

You will then be queried about adjusting references and you must give an answer so type Y<R>:

```

B2 (2*A2)
Gen Next: Adjust references
File, All, Entry, Block, Line, Column, 0-9
Next: Copy A B C
1 2| 4|
2 2<
3
4
C4 65465 Auto.
    
```

```

B2 (2*A2)
Gen Next: ADJUSTREFERENCES
File, Print, Mail label
Next: Copy all - Destination B C
1 2| 4|
2 2<
3
4
C4 65465 Auto.
    
```

You can see that what was '2*A1' in B1 has been altered to '2*A2' in B2. If you think about it, the adjustment option has kept the meaning of the first line, i.e. 'two times the value on the left', in the second line. You will find this 'relative' factor much the same for columns.

So far you have seen that Copy works the same as Move, except that the original data remains, the copied data overwrites anything that was already in the new position. However, you will now see that the Copy command is much more flexible than that - it can be used to send data to the disk or to the printer as well.

The option we would use to do this is Copy All. THE CRACKER only uses this command to send the data from the sheet the Printer or to a disk file. (If you really did want to duplicate the entire data within the sheet you would have to define it as one large block). Note that you can of course copy portions of the sheet, entries, lines, columns or blocks, to the disk or printer as well.

We will look at these in detail soon but for now it does no harm to run through the way data is saved to disk. Note the following sequence carefully and when working seriously with the spreadsheet, copy your data to disk regularly.

Type CAF for Copy All to File

```

B2 (2*A2)
Gen Next: Copy A B C
1 2| 4|
2 2<
3
4
C4 65465 Auto.
    
```

```

B2 (2*A2)
Gen Next: Copy all - Destination B C
1 2| 4|
2 2<
3
4
C4 65465 Auto.
    
```

If you answer MYWORK when prompted for a file name the whole of the sheet will be copied to a file called MYWORK.MEM.

```

B2 (2*A2)
Gen Next: Copy all - Destination Filename MYWORK
File, Print, Mail label
Next: Copy all - Destination Filename MYWORK
1 2| 4|
2 2<
3
4
C4 65465 Auto.
    
```

In a similar way, all the entries could be copied to the printer. The command area and axes markers would be excluded.

Recap: You have seen how the move and copy commands have many similarities. They can be operated on a sections of the sheet of variable size to transfer or reproduce data. Both overwrite any data already present at the destination. Both transfer the cell formats together with the cell data.

A NOTE ON ADJUSTING REFERENCES - LAGGED VARIABLES

You have seen that when using the Copy command you are prompted with the question

Adjust references to new location?

When using the move command the adjustments are made automatically, you are not asked.

If you are moving or copying a line with adjustment then any internal references made to other cells along the same line will be adjusted to reflect the new position. Similarly, when a column is copied or moved adjustments are made within the column and the same is true when a block is copied - all references to cells within the defined block are also changed.

Normally references to any cells which are outside the moved or copied section will not be adjusted. However there is an inbuilt option to get round this if you want to. Any reference will be automatically adjusted if you follow the data it contains with a single quote. The technical term used for this is an offset or lagged variable.

It may not be immediately clear why you would want to do this, or how it works, so just follow this simple example.

Imagine you were preparing a sheet that is designed to compare a value from column to column, i.e. each column will contain a cell that refers to a cell in a column adjacent to it. If any of the columns were copied the reference to the previous column would remain unchanged unless marked by the Quote character, as a result the sense of the sheet would be lost.

The idea will be explained much more clearly if you follow this worked sheet for preparing a simple cash flow.

PREPARING A SIMPLE CASH FLOW

One of the most common applications for spreadsheets is budgets and cash flow predictions. You are going to see how to prepare a cash flow sheet using some of the short cuts that THE CRACKER provides. Even if you aren't interested in financial applications it is worth studying this example because it demonstrates multiple copying, lagged or offset variables and automatic reference adjustment.

You will normally start by setting up a text column with the various items to be included in your cash flow. Here is a very simplified example.

```

A2 Txtr ABCDEFGIJKLMNOPQRSTUVWXYZ!*->./>.'(*& arrows
Next:
A
1 CASH FLOW EXAMPLE
2<
3 Balance brought forward
4
5 INCOME
6
7 Item 1
8 Item 2
9 Total income
10
11 EXPENDITURE
12
13 Office
14 Factory
15 Miscellaneous
16 Total Expenditure
17
18 Balance
A18
65377
Auto.
    
```

As you can see there are four basic elements. These are the balance brought forward, the income, the expenditure and the balance for the period. The balance brought forward always refers to the previous period. The other three elements always refer to the current period.

Now you will see the rules that might make up such a sheet. This display was obtained using the X for exchange command. Temporarily the width of column B has been increased so you can see everything. At this stage no actual values have been entered.

Move the cursor right in the answer to Destination and you will arrive at.

B1	OFIn	Next:	A	B	C	E18
1	CASH FLOW EXAMPLE	<				52591
2	Balance brought forward	????????????????????????????				Auto.
3	INCOME					
4	Item 1					
5	Item 2					
6	Total income	<1>	(SUM(B7...B8))			
7	EXPENDITURE					
8	Office					
9	Factory					
10	Miscellaneous					
11	Total Expenditure	<2>	(SUM(B13...B15))			
12	Balance	<3>	(B3+B9-B16)			

The line of question marks relates to data that has not yet been put in. This is to remind you to do so later. This is the dummy for the first month. Now you copy these formulae for the second month.

B1	OFIn	Next:	A	B	C	E18
1	CASH FLOW EXAMPLE	<				52591
2	Balance brought forward	????????????????????????????				Auto.
3	INCOME					
4	Item 1					
5	Item 2					
6	Total income	<1>	(SUM(B7...B8))			
7	EXPENDITURE					
8	Office					
9	Factory					
10	Miscellaneous					
11	Total Expenditure	<2>	(SUM(B13...B15))			
12	Balance	<3>	(B3+B9-B16)			

C1	OFIn	Next:	A	B	C	D	E18
1	CASH FLOW EXAMPLE	<					52591
2	Balance brought forward	????????????????????????????					Auto.
3	INCOME						
4	Item 1						
5	Item 2						
6	Total income	<1>	(SUM(B7...B8))				
7	EXPENDITURE						
8	Office						
9	Factory						
10	Miscellaneous						
11	Total Expenditure	<2>	(SUM(B13...B15))				
12	Balance	<3>	(B3+B9-B16)				

B1	OFIn	Next:	A	B	C	E18
1	CASH FLOW EXAMPLE	<				52561
2	Balance brought forward	????????????????????????????				Auto.
3	INCOME					
4	Item 1					
5	Item 2					
6	Total income	<3>	(SUM(B7...B8))			
7	EXPENDITURE					
8	Office					
9	Factory					
10	Miscellaneous					
11	Total Expenditure	<4>	(SUM(B13...B15))			
12	Balance	<5>	(B3+B9-B16)			

You can see the balance brought forward is still undefined. But it is equal to the value in B18 and so you can put B18 in C3. The balance brought forward always relates to the preceding column. You want to set up column C so that you can copy it a few more times for the other months and include the balance brought forward. If you just put B18 in C3 and copy it, then the value B18 will remain unchanged. The Copy command only adjusts the formulae that relate to references up and down the column, other references are unaffected.

There is a simple way round this problem, just follow the reference by a single quote mark. This tells THE CRACKER that you want the reference adjusted whenever a copy is made. So B18 becomes B18'.

C3	(B18')	E18	52551	Auto.
OfIn	ABCDEFGHIJLMNOPQRSTUVWXYZ+->.<.* arrows			
Next:				
1				
2				
3	<6> (B18')			
4				
5				
6				
7				
8				
9	<1> (SUM(C7...C8))			
10				
11				
12				
13				
14				
15				
16	<2> (SUM(C13...C15))			
17				
18	<7> (C3+C9-C16)			

You now have a full dummy column for further copying. Note that the actual number of entries you have made so far is very few. For this example we are just going to set up two further months. This time you specify that you want the column to be copied two times.

C3	(B18')	D	E
OfIn	ABCDEFGHIJLMNOPQRSTUVWXYZ+->.<.* arrows		
Next:			
1			
2			
3	<6> (B18')		
4			
5			
6			
7			
8			
9	<1> (SUM(C7...C8))		
10			
11			
12			
13			
14			
15			
16	<2> (SUM(C13...C15))		
17			
18	<7> (C3+C9-C16)		

Again you will be asked for a destination and whether you want to adjust references.

D1	ABCDEFGHIJLMNOPQRSTUVWXYZ+->.<.* arrows	D	E
OfIn			
Next:			
1			
2			
3	<6> (B18')	<10> (C18')	<14> (D18')
4			
5			
6			
7			
8			
9	<1> (SUM(C7...C8))	<8> (SUM(D7...D8))	<12> (SUM(E7...E8))
10			
11			
12			
13			
14			
15	<2> (SUM(C13...C15))	<9> (SUM(D13...D15))	<13> (SUM(E13...E15))
16			
17	<7> (C3+C9-C16)	<11> (D3+D9-D16)	<15> (E3+E9-E16)
18			

You can see that the balance brought forward has been adjusted for the new location in the way you would want. With a bit of tidying and the addition of actual figures you will achieve something like this.

```

E4      ABCDEFGHILMNOPQRSTUVWXYZ!+->.<(* arrows
OF In   |
Next:   |
1 CASH FLOW EXAMPLE |
2 Balance brought forward | 1,000.00 | B | C | D | E
3                                     200.00 | 3,000.00 | 4,250.00 >
4 INCOME
5
6 Item 1 | 1,500.00 | 2,250.00 | 2,750.00 | 3,500.00
7 Item 2 | 9,000.00 | 12,750.00 | 13,500.00 | 14,750.00
8 Total Income | 10,500.00 | 15,000.00 | 16,250.00 | 18,250.00
9
10 EXPENDITURE
11 Office | 550.00 | 750.00 | 1,000.00 | 1,500.00
12 Factory | 9,250.00 | 10,250.00 | 11,500.00 | 13,000.00
13 Miscellaneous | 1,500.00 | 1,200.00 | 2,500.00 | 4,000.00
14 Total Expenditure | 11,300.00 | 12,200.00 | 15,000.00 | 18,500.00
15
16 Balance | 200.00 | 3,000.00 | 4,250.00 | 4,000.00 |
17
18
    
```

E18
64749
Auto.

SAVING LOADING AND PRINTING - A FURTHER LOOK AT THE COPY COMMAND

As you have seen, any part of the worksheet can be copied to any other part, to the disc or to the printer. Similarly you can copy from disc files into the worksheet.

Copying to the printer is the same as copying within the worksheet but for the destination give P for printer.

For disc files give the destination as F for file. You will then be asked for a filename. You may not be fully familiar with the filename conventions used for computing so here is a summary.

The filename may be up to 8 characters long and may include any printable character except \$*?=/.: or space. The filename is followed by a '.' and then an extension which defines the type of file. There are only 4 extensions that THE CRACKER recognizes .MEM, .TXT, .DAT and the type of file you want to read or write and, if reading, it will expect the file to contain information in a certain form.

For those systems that support PASSWORDS this facility is available with THE CRACKER. Passwords may be up to 8 characters in length and are given after the filename and extension but preceded by a '.'.

For example to read the file SALES.MEM with a password SECRET type SALES.MEM;SECRET for the full filename. Actually with a .MEM extension you can type SALES;SECRET and the .MEM extension will be assumed as a default.

Let us look in more detail at the types of file.

If you wish to save all or part of the worksheet in such a way that THE CRACKER can read it and display it in its original form then use the .MEM (for memory) extension. This is the only option that allows you to load in rows or columns that are empty of data and can, therefore, be used for loading a predefined worksheet matrix into which you can insert data. A useful example would be in the preparation of yearly accounts that conform to a regular pattern.

Next there is the .DIF file or Data Interchange Format file. This type of file can transfer text and numbers between different types of spreadsheet and is commonly used by graphics packages as means of collecting the data. THE CRACKER can read and write these files. You should not concern yourself with the internal organisation of these files.

If you want to write out all or a part of your worksheet to a file that can be used by an editor or word processing program give it a filename .TXT for text extension. This is very useful if you want to incorporate the results calculated by THE CRACKER into a full written report.

You can also read in a .TXT file and this provides a useful way of bringing in tables of information from other programs. The numbers and text coming in will need to be in a proper tabulated form as the information is allocated to cells in the sheet depending on its location along each line. The .TXT filetype is the only other example where it is possible to load in data without having first defined the worksheet. If you attempt to do this, THE CRACKER will first read the number of lines in the data and assign each of these to a row in the sheet. However all of the information across the lines will be assigned to one, possibly very large, column. Do make sure that this column is not allowed to exceed 127 characters, which is the absolute maximum column width possible.

The .DAT extension is used when you wish to read a file of pure numeric data into your sheet. The file should be in character form such as you would get from an editor or word processor, or from formatted output from the programming languages FORTRAN or BASIC. Be careful that if more than one column is being read then zero readings should be shown by a 0 and not just by blanks. It will do no harm but except if there was a blank in the first column, in which case the second column will be read as if it was the first. This form of file does not have to be properly tabulated as the lines are scanned to find the numbers on them.

Let us try an example of loading in one of these file types.

If you have an editor available, make a file such as EXAMPLE.DAT which contains this information:

```
2.34 23.7
456.73 84
27 3
63.3 1234.5
```

Then load THE CRACKER and create a worksheet of sufficient size to hold the entries. Type I2C15<R>G<R> then I3L<R><R> to do this:

```

A1 Gen      FILENAME:EXT <R>
Next: Copy filename EXAMPLE.DAT B
 1<  | | | |
 2  | | | |
 3  | | | |
 4  | | | |

```

```

A1 Gen      End, Up, Down, Left, Right, arrows, Jump, <R>
Next: Destination A
 1<  | | | |
 2  | | | |
 3  | | | |
 4  | | | |

```

Type <R> to indicate you want A1 to be the start:

```

A1 (2.34)
Gen ABCDEFGIJLMNOPQRSTUVWXYZ!+-></'* arrows
Next:
 1<  A      2.34>      B      23.7|
 2  |      456.73|      84|
 3  |      27|        3|
 4  |      63.3|      1234.5|

```

The entries from your incoming .DAT file will be displayed in the default format of the columns. Because THE CRACKER knows that a DAT file contains numbers only, if the default format is text then the General numeric format will be used instead.

Remember that any blank cells must be represented by a zero or the layout may be structured wrongly.

For example if the EXAMPLE.DAT file contains this:

```
' 1.23'
'2.34 5.67'
```

it will be read into THE CRACKER as

```

=====A=====
1 1.23 5.67
2 2.34 5.67

```

If you want to output a file of numbers you can also use the .DAT extension. When you do this any text will be ignored and only the numerical values will be sent to the file. To give you a demonstration change A1 to a text entry by typing FTL<R> followed by typing "Text"<R>.

If you now leave THE CRACKER by typing Q<R> (note your work is automatically saved as SECURITY.MEM in case you later regret leaving at that point):

```

A1 TEXT
TxTL ABCDEFGIJKLMNOPQRSTUVWXYZ+-\>.(/* arrows
Next: Format to be Text left justified <R>
      A
1< 23.7|
2 456.73|
3 27|
4 63.3| 1234.5|
      B
1< 23.7|
2 84|
3 3|
4 1234.5|
  
```

```

A1 TEXT <R>
TxTL
Next: quit
      A
1<TEXT > 23.7|
2 456.73| 84|
3 27| 3|
4 63.3| 1234.5|
  
```

```

A1 TEXT
TxTL ABCDEFGIJKLMNOPQRSTUVWXYZ+-\>.(/* arrows
Next:
      A
1<TEXT > B 23.7|
2 456.73| 84|
3 27| 3|
4 63.3| 1234.5|
  
```

In case you forgot, there is a copy in the file called SECURITY

Now save the file by typing CA<R>F and EXAMPLE2.DAT<R>:

```

A1 TEXT
TxTL
Next: Copy all - Destination File, Print, Mail label
      A
1<TEXT > B 23.7|
2 456.73| 84|
3 27| 3|
4 63.3| 1234.5|
  
```

You can use the DOS system command TYPE EXAMPLE2.DAT<R> and you will get this display:

```

0.0 23.7
456.73 84
27 3
63.3 1234.5
  
```

As you can see, the text entry was not included but was made into a zero entry so as not to throw the columns out of alignment. The file is comma delimited, each piece of data is separated from the next by a comma, so that BASIC and FORTRAN can read it (if this means nothing to you don't worry, it is another piece of computing convention). You will not see the commas in the display.

```

A1 TEXT
TxTL
Next: Copy all - Destination Filename EXAMPLE2.DAT
      A
1<TEXT > B 23.7|
2 456.73| 84|
3 27| 3|
4 63.3| 1234.5|
  
```

To see how the .TXT extension works you will first need to load THE CRACKER and get back your previous sheet. Type CRACKER to load it then type CF and SECURITY<R>.

Remember SECURITY.MEM is normally an extra emergency only copy of your sheet. Type CA<R>F and EXAMPLE3.TXT:

```

A1 Text
TXL Next: Copy all - Destination File, Print, Mail label
      A
1<Text > 23.7|
2 456.73| 84|
3 27| 3|
4 63.3| 1234.5|
    
```

```

A1 Text
TXL Next: Copy all - Destination Filename EXAMPLE3.TXT
      A
1<Text > 23.7|
2 456.73| 84|
3 27| 3|
4 63.3| 1234.5|
    
```

Now quit THE CRACKER as you did above Q<R> and enter TYPE EXAMPLE3.TXT<R>:

```

Text 456.73 23.7
      27 84
      63.3 3
      1234.5
    
```

This time all your entries including the text have been displayed. With files stored using the .TXT extension only the body of the worksheet will be in the file, not the control area, column letters or line numbers.

Finally, there are two additional utilities supplied on the distribution disk that can be used to convert Cracker MEM files into a format that can be read by the database program Dbase II from Ashton Tate. These must be used from the command line of your computer's DOS, the conversion CANNOT be done after you have loaded THE CRACKER.

- 1) Translation from THE CRACKER format to dBASE II.

If you wished to translate a file WORK.MEM to the format for dBASE II then use the following command line:

```
A>MEMDBF WORK
```

The translation will then be found in a file called WORK.DBF.

- 2) Translation from dBASE II to THE CRACKER.

To translate from the dBASE II file WORK.DBF to THE CRACKER format use this command line:

```
A>DBRMEM WORK
```

The translation will be in a file called WORK.MEM. When you first use WORK.MEM in THE CRACKER start by using the 'V' for 'Verify and recalculate' command. This is necessary to establish any numerical entries in the correct form for storage internally.

PRINTING FROM THE CRACKER

Remember that the Copy command is also used for printing data onto paper by specifying P for printer as the destination. Any specified Entry, Line, Column, Block or All of the sheet can be printed. The data that is printed will appear without any column dividers, status lines or other system messages, but will be spaced and displayed in a way that conforms to the existing display format, column widths etc.

In order to fit a lot of data on a page you may wish to make use of the OUT(char) command to send control characters to your printer so that condensed print can be selected. Consult your printer manual for details of what type faces it is capable of, and which codes are required to select between them.

It is sometimes desirable to be able to print out a copy of the formulae or data as it was entered rather than as it appears under the current format. Use the X for exchange command to alter the display and then amend the column widths as required. (It is important to remember this last step or unpredictable effects may result.)

There is also the option of using the CTRL-P key combination for producing a printed copy of the screen. All status lines and dividers are reproduced exactly as seen.

PRINTING OF MAIL LABELS

If you are using THE CRACKER data cells to keep a record of names and addresses, see also the sections on Searching and Sorting of data which you will probably also find useful.

If you want to keep address lists then a common requirement is to prepare and print mailing labels. Blank labels are available on listing paper suitable for most printers, THE CRACKER is able to produce these labels for you. Your mailing list will however need a little preparation in the sheet.

Use the demo file ADLIST.MEM for working through the following examples.

The first stage is to indicate the ends of the lines to be printed. To do this you must insert columns at the appropriate points, each with a Carriage Return default format. A Carriage Return is the code that you send to a printer that signals that you want it to start a new line. This has been included in the possible categories of default formats solely to allow you to control your printer - you should not actually enter any data into this column.

In this example you will not want to print the last column as it only contains a reference to the amount of money paid. You must start by putting a carriage return column in front of column C:

Al	Init	0-9, <R>					
1	Next: Insert column, width 1	A	B	C	D	E	F
2		<Init>Name	No	Road	Town	IS	
3	R.T. Cowan	16	Jeremy Grove	Hampton	17		
4	G.L. Blake	137	Osmaston Road	Knoble	56		
5	A.J. Hunt	125	Latimer Road	Wythall	43		
6	H.A. Fisher	132	Florence Road	Henley	28		
7	C.D. Beard	186	Valley Road	Redditch	25		
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							